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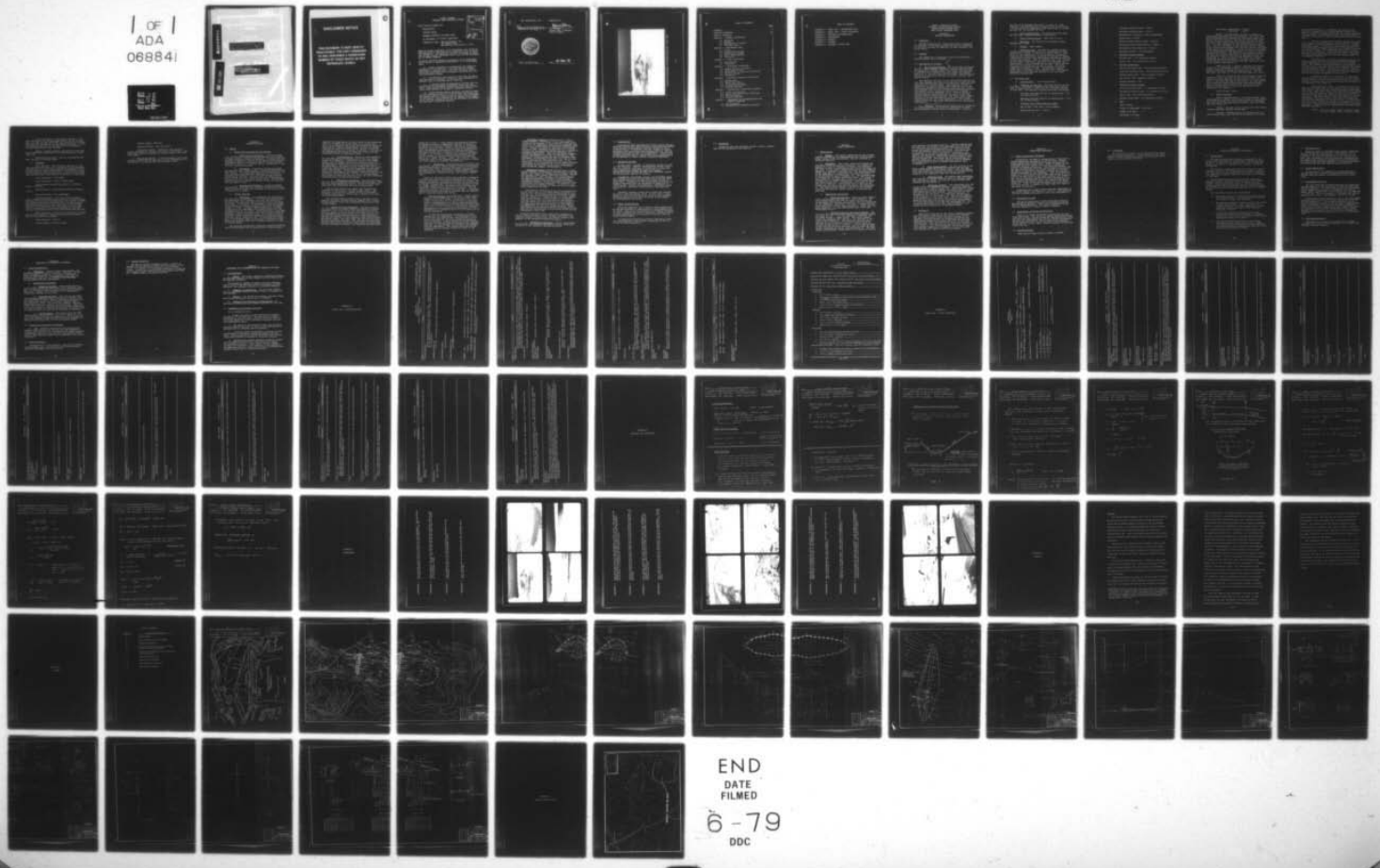

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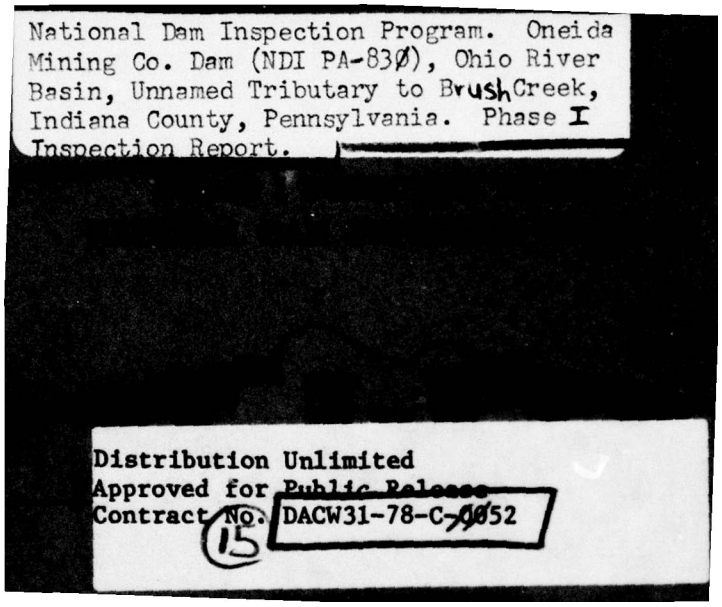
National Dam Inspection Program. Oneida Mining Co. Dam (NDI PA-83Ø), Ohio River Basin, Unnamed Tributary to Brush Creek, Indiana County, Pennsylvania. Phase I Inspection Report.
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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Oneida Mining Company Dam

Pennsylvania

Indiana County

Unnamed tributary to Brush Creek

26 September 78 (visual inspection)

Inspection Team - GAI Consultants, Inc.
570 Beatty Road
Monroeville, Pennsylvania 15146

Based on visual inspection, past performance, and review of engineering data, the facility is considered to be in excellent condition. The emergency spillway is capable of passing the peak inflow associated with a storm of PMF magnitude and is deemed adequate.

To ensure continued adequate performance and provide additional safety to downstream inhabitants, it is recommended that:

a. Formal procedures be established with regard to maintenance of the facility. The owner should consider installing an extended stem on the blow-off pipe valve to facilitate operations during emergency conditions and routine maintenance checks.

b. The design of the protective cage over the principal spillway be reviewed in light of the consequences of possible loss of anchorage and/or vandalism.

c. A warning system be developed to provide for the notification of downstream inhabitants should the need arise. The program should include round-the-clock surveillance during periods of intense or prolonged rainfall.

d. Oneida Mining Company personnel continue to monitor the observation wells on a yearly basis and report any noticeable changes in water levels to their design engineer for evaluation. The condition of the seepage in the emergency spillway channel should also be addressed and changes in flow rate or turbidity reported.

GAI Consultants, Inc.

Bernard M. Mihalcin, P. E.

Date 21 Nov 78

Approved by:

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

Date 18 Dec 78

Overview Photograph of Oneida Mining Co., Inc. Dam

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
ONEIDA MINING COMPANY DAM
NDI# PA-830, PENNDER# 32-79

SECTION 1
GENERAL INFORMATION

1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

1.1 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. The Oneida Mining Company Dam is a zoned earthfill embankment approximately 900 feet in length with a maximum height of 50 feet. The structure is provided with a tapered clay core founded on alluvial materials in a 10-foot deep cut-off trench. The facility is served by an emergency spillway, principal spillway, and a pumping system.

The emergency spillway is cut into natural materials on the right abutment and lined with riprap to a height of five feet above the spillway floor. The principal spillway is composed of a 30-inch diameter steel riser set on the upstream left abutment at normal pool elevation 1735. A 24-inch diameter blow-off pipe provides for emergency drawdown. The blow-off pipe is valved at the bottom of a manhole accessible from the embankment crest. By-pass piping is also provided on the blow-off line in order to maintain minimum required downstream flow. The water supply system consists of two 12-inch diameter steel pipes with intake elevations at 1720 and 1725, respectively. This system supplies water for use in the preparation plant and related facilities.

b. Location. Oneida Mining Company Dam is located on an unnamed tributary of Brush Creek approximately three miles southeast of Brush Valley, Pennsylvania. Access to

the site is by township road off U. S. Route 56. Dam, reservoir, and watershed are contained on the Brush Valley 7.5 minute U.S.G.S. quadrangle. The coordinates of the dam are N40° 00' 37" and W79° 01' 30".

c. Size Classification. Intermediate 50 feet high, 800 acre-feet, storage capacity at top of dam).

d. Hazard Classification. High (see 3.1.c.5).

e. Ownership. The Oneida Mining Company, Seward, Pennsylvania 15954.

f. Purpose. Water supply.

g. Historical Data. According to PennDER records, Oneida Mining Company applied to the Commonwealth of Pennsylvania for a permit to construct a dam on July 31, 1973. Prior to this application, L. Robert Kimball, Consulting Engineers were retained by Oneida Mining Company to develop a site study, design a dam, and prepare construction specifications and drawings. Frank M. Sheesley, Inc., was retained as the prime contractor to construct the embankment and appurtenances. Work commenced at the site in early October 1973 and was completed in the fall of 1974. The final inspection of the facility by all concerned parties was conducted on November 1, 1974. The reservoir reached normal pool in December 1974 or January 1975. The dam and appurtenances have operated normally in the four years following construction.

1.3 Pertinent Data.

a. Drainage Area. ≈ 0.64 square miles.

b. Discharge at Dam Site. Discharge records are not available. The owner's representative indicated a record pool of approximately 5 inches over the principal spillway in July 1977. The emergency spillway has never discharged.

Principal Spillway Capacity at Maximum Pool ≈ 132 cfs (design value).

Emergency Spillway Capacity at Maximum Pool ≈ 1770 cfs (design value).

c. Elevation (feet above mean sea level).

Top of Dam - 1744 (1747, top of Camber).

Maximum Design Pool - 1739.0.

Principal Spillway Crest - 1735.0.

Emergency Spillway Crest - 1737.5.

Maximum Pool of Record ≈ 1735.4 (estimated).

Normal Pool - 1735.0.

Upstream Portal Outlet Invert - 1705.0.

Downstream Portal Outlet Invert - 1695.0.

Streambed at Dam Centerline - 1703.0.

Maximum Tailwater - Not applicable.

d. Reservoir Length (miles).

Maximum Pool ≈ 0.5 (elevation 1744.0).

Normal Pool ≈ 0.4 (elevation 1735.0).

e. Storage (acre-feet).

Service Spillway Crest ≈ 410 (elevation 1735.0).

Emergency Spillway Crest ≈ 510 (elevation 1737.5).

Maximum Design Pool ≈ 580 (elevation 1739.0).

Top of Dam ≈ 800 (elevation 1744.0).

Design Surcharge ≈ 220.

f. Reservoir Surface (acres).

Service Spillway Crest ≈ 37 (elevation 1735.0).

Emergency Spillway Crest ≈ 41 (elevation 1737.5).

Top of Dam ≈ 50 (elevation 1744.0).

Maximum Design Pool ≈ 43 (elevation 1739.0).

g. Dam.

Type - Earth.

Length of Embankment ≈ 900 feet.

Height ≈ 50 feet.

Top Width ≈ 30 feet.

Side Slopes (downstream) - 2.5H:1V
(upstream) - 3H:1V

Zoning - The embankment contains an impervious core section consisting of clay materials. The outer zones of the embankment both upstream and downstream consist of random fill materials excavated from the core cutoff trench and the emergency spillway. The design includes a gravel and sand filter blanket under the downstream zone of random fill. The total thickness of the filter blanket is three feet. A 2-foot thickness of fine aggregate material serves as an inclined drain between the clay core and the downstream random zone of the embankment. A rock toe drain is provided at the downstream toe with provisions to collect the drainage from the filters. For wave and ice protection, there is resistant rock riprap (limestone) on the upstream face of the dam from elevation 1725.0 to the embankment crest (see Photograph 2). Below elevation 1725, there is a cement stabilized aggregate extending to elevation 1720. This latter feature was below current pool and, therefore, could not be observed (see Figure 6).

Impervious Core - Figure 6 indicates the central portion of the embankment contains a 10-foot deep cutoff trench containing a tapered clay core built up from the bottom of the cutoff trench to elevation 1741. The clay core has a top width of 15 feet and side slopes of 0.5H:1V.

Cutoff - A cutoff trench was constructed along the embankment centerline from Station 12+80 to 20+90. The trench is 10 feet deep with a bottom width of 15 feet tapering to 3 feet near the ends of the trench. The top width of the trapezoidal shaped trench varies from approximately 3 feet at the end stations on both the right and left abutments to approximately 55 feet near the center of the embankment (see Figure 4).

Grout Curtain - None.

h. Outlet Conduits.

Type (submerged inlet) - A 24-inch diameter steel pipe encased in concrete with concrete cutoff collars spaced at 20-foot intervals is constructed beneath the embankment. The inlet end is equipped with a stainless steel bar trash rack (see Figure 7).

Length - 252 feet to the junction with the 30-inch diameter principal spillway outlet pipe.

Closure - Drawdown control is provided by a 24-inch diameter gate valve located at the bottom of the gate

valve control manhole. In addition, the 24-inch valve housing is equipped with a 3-inch diameter by-pass gate valve to provide a minimum downstream flow without operating the main valve. An aluminum stop gate can be installed at the inlet to the outlet conduit immediately behind the trash rack.

Access - The gate valve control manhole is located on the crest of the embankment at Station 15+50. The 48-inch diameter reinforced concrete pipe manhole is equipped with ladder rungs. At the base, the manhole enlarges to a 72-inch diameter reinforced concrete pipe chamber containing the control valves. (The manhole was not entered at the time of this inspection. Oneida Mining Company representative, Mr. Bruce Bufalini, indicated that an air compressor is required to purge stale air from the manhole before it can safely be entered.)

Stilling Basin - The 24-inch diameter outlet conduit joins with the 30-inch diameter spillway discharge conduit approximately 94 feet upstream of the stilling basin. The combined flow passes beneath the embankment via a 30-inch steel, concrete encased pipe, equipped with cutoff collars spaced at 20-foot intervals to discharge directly into the stilling basin. The stilling basin is 8 feet wide and 16 feet long and is equipped with a concrete baffle to provide for energy dissipation (see Figure 5).

Regulating Facilities - Discharge is controlled via the 24-inch gate valve at the bottom of the gate valve control manhole. The 3-inch by-pass gate valve is used to maintain a minimum flow in the stream channel downstream of the embankment (see Figure 7).

Type (submerged inlet) - In addition to the drawdown control outlet, two 12-inch diameter steel pipes provide water to the pump house located immediately downstream of the dam. Both water supply pipes pass beneath the embankment in parallel fashion. They are encased in monolithic concrete and equipped with cutoff collars spaced at 20-foot intervals. The water supply intakes draw water from two elevations. The lower intake is on the left abutment upstream of the embankment at elevation 1720. The other inlet is at elevation 1725 and is joined to the supply line conduit via a riser extending through a portion of the upstream embankment. Both intakes are equipped with stainless steel mesh box strainers.

Length ≃ 250 feet (lower intake, elevation 1720).
≃ 205 feet (upper intake, elevation 1725).

Outlet Facilities - Both pipes terminate in the pump house where two 250-horsepower pumps, one as an auxiliary, are used to pump water from the reservoir to a storage tank near the mine for use in the preparation plant. A 12-inch diameter blow-off at the pump house can discharge directly downstream of the facility.

Access - Pumping controls are located in the pump house immediately downstream of the embankment (see Photograph 11).

Regulating Facilities - Flow is regulated by the pump controls in the pump house.

i. Spillway.

Type (service) - The principal spillway is a 30-inch diameter steel pipe riser located on the left abutment. Overflow into the riser passes beneath the embankment via a 30-inch diameter steel pipe encased in concrete with cutoff collars spaced at 20-foot intervals. A loose fitting steel cage over the inlet is provided to function as a trash rack.

Crest (diameter) - 48 inches.

Crest Elevation - 1735.0 (normal pool).

Length (principal spillway invert to stilling basin) ≈ 306 feet.

Stilling Basin - (previously detailed in Section 1.3.h).

Upstream Channel - Not applicable.

Downstream Channel - An 8- to 10-foot bottom width, trapezoidal shaped, outlet channel is located beyond the outlet sill of the stilling basin. The channel is lined with riprap immediately downstream of the stilling basin. Approximately 100 to 150 feet downstream of the stilling basin is a semi-permanent weir with automatic staff gage used to regulate the minimum 62,000 gallon per day flow required by PennDER in the stream immediately below the dam.

Type (emergency) - Channel cut into natural ground on the right abutment. Riprap lining covers the lower 5 feet of the channel side slopes.

Crest Elevation - 1737.5

Channel Width - 30 feet at base

Channel Length ≈ 450 feet

Upstream Channel - Not applicable

Downstream Channel - Discharges into the main stream approximately 150 feet below the stilling basin. The downstream channel is moderate to steeply sloping and generally wooded.

j. Regulating Outlets. A 24-inch diameter gate valve located near the base of the center of the embankment and is accessible via a manhole atop the embankment crest.

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Design Data Availability and Sources.

1. Hydrology and Hydraulics. Extensive hydrologic and hydraulic studies were performed by the designers L. Robert Kimball, Consulting Engineers. Pertinent data are available in Volume I, Part II of the design report entitled "Engineering Report for Earthfill Dam for a Water Storage Reservoir at Mine No. 4, Indiana County, Pennsylvania," July 1973 and filed with PennDER.

2. Embankment. A detailed geotechnical study was performed by L. Robert Kimball, Consulting Engineers for this project. The study encompassed an investigation of the soil, geologic, and hydrologic conditions of the site to determine its feasibility for a dam and storage reservoir, and to design this dam. Pertinent data are summarized in Volume I, Part II of the above design report. Construction specifications are contained in Volume II and are available from the owner's files.

3. Appurtenant Structures. Design parameters and hydrologic data used for sizing the emergency and principal spillway structures are presented in the report listed in Section 2.1.a, above.

b. Design Features.

1. Embankment. The embankment was designed to be constructed in one season. A 10-foot deep cutoff trench was backfilled with impervious clay fill and extended to elevation 1741 with side slopes of 0.5H:1V and a top width of 15 feet. In addition, the embankment contains a sloping inclined drain and blanket drainage beneath the downstream random fill zone. To insure adequate drainage, the downstream toe of the embankment has a dumped riprap rock toe throughout most of its length. Slope protection is provided upstream by riprap overlying a thin filter blanket from the embankment crest to elevation 1725. The riprap is held in-place by a cement stabilized aggregate toe extending from elevation 1725 to elevation 1720. To compensate for settlement a longitudinal camber of the crest is provided in the form of a parabolic curve with a maximum ordinate of 3 feet at maximum section.

The artesian ground-water conditions encountered during the site exploration and the possibility of under seepage

required the installation of relief wells in the downstream rock toe. Between the relief wells are 8 observation wells. The downstream toe relief and observation wells are installed to a depth of approximately 35 feet and extend from Station 15+00 to Station 19+00. Figure 9 gives the construction detail for a typical relief well. The plan of the embankment (see Figure 5) shows the location of the downstream relief and observation wells.

2. Instrumentation. Extensive instrumentation was provided during the construction of the dam. Eight pneumatic piezometers, 3 observation wells, 2 settlement gages, and 2 settlement plates were installed along the maximum section between the crest and the downstream toe of the embankment. The purpose of the piezometers was to ascertain during reservoir filling, whether the core cutoff trench was effective and whether undesirable uplift pressures might develop. Figure 8 provides the construction detail for the pneumatic piezometers, observation wells, and settlement gages and plates. The plan of the embankment (see Figure 5) shows the location of all the above mentioned instrumentation and monitoring devices.

3. Appurtenant Structures. The principal spillway is a 48-inch diameter concrete crested drop inlet. Flow over the crest immediately enters a 30-inch diameter steel pipe riser that discharges into the stilling basin.

The stilling basin is an impact type structure as described in the U.S.B.R. "Design of Small Dams." The structure is fitted with a hanging buffle to dissipate tailwater energy before release over a concrete sill into the downstream channel.

The 24-inch diameter outlet conduit and the 30-inch diameter principal spillway conduit combine into a single 30-inch diameter outlet that discharges directly into the stilling basin.

c. Design Data and Procedures. The design parameters developed by L. Robert Kimball are based on accepted standards as set forth by the Soil Conservation Service. Since a failure of the structure could cause loss of life, the impoundment was given a Class "C" classification as based on the proposed classification of dams developed by the American Society of Civil Engineers Task Group on Spillway Design Floods. For this study, the 100-year Principal Spillway Hydrograph was used. The principal spillway crest elevation was set at 1735.0 and flood routing the Principal Spillway Hydrograph resulted in an emergency spillway crest

elevation of 1737.5. Flood routing the Emergency Spillway Hydrograph through the impoundment resulted in spillway discharge of 331 cfs at elevation 1738 with an associated storage of 170 acre-feet. However, due to dam classification, the emergency spillway was designed on Probable Maximum Precipitation which resulted in a maximum spillway discharge of 1826 cfs at elevation 1744 with an associated storage of 396 acre-feet. Detailed calculations for this analysis appear in the previously mentioned Engineering Report by L. Robert Kimball. (Note: The Class "C" classification given in the designer's report is based on potential flood damage to Dilltown, Pennsylvania.)

2. Embankment. Test borings were drilled in the impoundment area by L. Robert Kimball, Consulting Engineers. Samples secured during drilling were subject to the following laboratory tests: Mechanical analysis, hydrometer, Atterberg limits, specific gravity, consolidation, constant head permeability, Standard Proctor, and triaxial compression.

After the laboratory testing was performed, subsurface cross-sections and profiles were developed for use in the seepage, settlement, and stability analyses and design. The seepage analysis was performed by the flow net method using $Q = kh \frac{nf}{np}$. Navdocks DM-7 was used as the reference for the settlement analysis using variations of the standard one-dimensional consolidation equation of Terazaghi. For the stability analysis, two methods were utilized: 1) Modified Swedish Slip Circle utilizing an in-house IBM 1130 computer; and 2) Simplified Bishop Slip Circle.

Seepage Analysis (excerpted from L. Robert Kimball Report). The permeability of the soils at the site ranged from 2×10^{-5} ft/min. in the silts to 2×10^{-7} ft/min. in the clays to 2×15^{-3} ft/min. in the silty sands as determined by the constant head permeability tests. The permeability of the material for use in the clay core is 2×15^{-7} ft/min. at 95 percent compaction. The material to be used in the random portion of the embankment has a permeability of 2×15^{-4} ft/min. at 90 percent compaction.

A flow net analysis was performed to estimate seepage from the impoundment. A permeability of 2×15^{-7} ft/min. was used for the clay core and 2×10^{-4} ft/min. was used for the entire foundation material. From the analysis, a total seepage of 11 gpd from the clay core and 742 gpd from the foundation was computed. Therefore, a total seepage of $\pm$753 gpd is anticipated from the impoundment. The analysis does not include consideration for seepage through the sides of the reservoir.

Settlement Analysis (excerpted from L. Robert Kimball Report). The theory of one dimensional consolidation was applied in the settlement analysis with values of the compression index and recompression index from e log p curves based on laboratory consolidation tests. Primary consolidation was computed utilizing the above data. Secondary compression over a period of 30 years and settlement within the embankment were determined empirically. From the settlement analysis, a total settlement of 1.9 feet was determined. The square root fitting method was used to determine time-settlement relationships which were then used to estimate a construction time-settlement rate. It is anticipated that the settlement will be faster than the curve shown in the appendix due to the difficulty of correlating the sand and gravel zones to determine their thickness, extent, and continuity.

Stability Analysis (edited excerpt from L. Robert Kimball Report). To determine the stability of the dam design, two methods of analyses were utilized. The dam was analyzed under several conditions-including, end of construction, rapid drawdown, and steady seepage. The selected parameters utilized in the analyses included parameters from triaxial compression tests, hydrostatic pressure, excess hydrostatic pressure, and construction pore water pressures. In addition, consideration for earthquake was made utilizing an earthquake coefficient of 0.05.

The degree of stability at the end of construction varies from a low of 1.25 (from Bishop analysis) to a high of +4.0 (from Bishop analysis) depending on which triaxial test on the foundation soils is used. Examining all analyses as a whole picture, it is concluded that the dam design is stable under all conditions analyzed except with high construction pore pressures and high excess pore pressures due to consolidation. If these pressures exceed 40 percent of the weight of the embankment, the dam will become unstable. These conditions will be monitored during construction of the dam, and the effectiveness of the filter drains will be determined at that time.

Triaxial compression tests, grain-size distribution curves, standard Proctor curves, seepage, settlement, and stability analysis calculations and drawings appear in the appendix of the designer's Engineering Report.

3. Appurtenant Structures. Design calculations and principal and emergency spillway discharge curves are presented in the designer's Engineering Report.

2.2 Construction.

Construction data available for review include contract drawings, construction specifications, daily progress reports (with related correspondence) from the designer's and/or PennDER's files. In addition, periodic inspection reports monitoring the construction were prepared by E. N. Cole for PennDER's Division of Dams and Encroachments. Construction activity was monitored on a daily basis by a representative of the designer L. Robert Kimball, Consulting Engineers.

2.3 Operations Records.

No pool level, rainfall, or discharge records are made for this facility. However, downstream of the dam a weir with an automatic staff gage is maintained to insure the owner complies with a PennDER requirement to discharge a minimum of 62,000 gallons per day. Weir discharge records are periodically reported to PennDER.

Piezometers, settlement, plates, and settlement gages were intensly monitored through construction and for about three months following the reservoir's first filling to normal pool. Evaluation of the instrumentation data by the designer indicated that the embankment is operating in a normal manner. Reading the piezometers, settlement plates and gages was, therefore, discontinued in the spring of 1975.

Currently, however, annual water levels are recorded for each of the observation wells. At this time, a level survey is usually conducted on the crest of the embankment. These data are currently filed by Oneida Mining Company and are available for review.

2.4 Other Investigations.

After the reservoir was in service, murky supply water at the mine prompted an investigation of the potability of the water. This study was performed to determine the extent of water treatment that would be required. Records concerning this investigation are available for review from the Oneida Mining Company.

No subsequent engineering related investigations have been conducted other than regular inspections of the facility by PennDER personnel.

2.5 Evaluation.

Sufficient data are available to make a Phase I assessment of the condition of the facility.

SECTION 3
VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of this project suggests the dam and its appurtenances were formally engineered, require little maintenance, and are currently in excellent condition.

b. Embankment. The visual inspection revealed the embankment to be in excellent condition. No evidence of seepage nor signs of sloughing or erosion were observed. The crest is well aligned horizontally and no settlement was detected. A slag-gravel roadbed protects the crest against damage from occasional vehicular use. The downstream slope of the embankment is covered with crownvetch that requires little maintenance (see Photograph 10). The upstream slope is covered with a durable limestone riprap. The riprap is well graded for the most part (2 feet to 3 feet maximum diameter) but is somewhat undersized (6-inch maximum diameter) below normal pool. Nevertheless, the riprap is performing its function. Below normal pool it was also observed that the riprap has been discolored (see Photograph 2). The discoloration appears to be due to the chemical nature of the reservoir water; however, no analysis was performed.

c. Appurtenant Structures.

1. Emergency Spillway. Based on visual observations, the emergency spillway is in good condition. The only seepage associated with the entire facility was observed within this channel approximately 100 feet downstream of the embankment centerline. The rate of seepage was not measurable due to low but dense vegetation. Aside from this minor condition, no other deficiencies were noted (see Photographs 6 and 7).

2. Principal Spillway and Outlet Conduit. The principal spillway and outlet conduit have separate intakes but merge at a point near the embankment centerline and discharge through a common outlet. The outlet conduit intake was submerged and, therefore, not observed at the time of this inspection. The principal spillway inlet appeared to be in excellent condition with no signs of concrete deterioration in evidence. A steel cage has been placed over the principal spillway inlet in order to guard against vandalism and injury (see Photograph 2). The cage design and securement raises doubts as to whether or not it

could perform its designed function. A manhole located atop the crest near the center of the embankment provides access to a 46-foot vertical concrete shaft, the bottom of which houses the manually operated gate valves. The valves were not inspected due to previous experience associated with stagnant air at the base of the shaft. According to the owner's representative, maintenance is rarely performed on the valves, although he assured the inspection team of their present operability. The outlet end of the discharge conduit was observed to be in good condition with no evidence of concrete deterioration or channel obstructions (see Photograph 9).

3. Water Supply System. The only portion of the water supply system that could be inspected was the pump house and mechanical units housed within. The units appear to be well maintained although they were not operated in the presence of the inspection team (see Photograph 11).

4. Reservoir Area. The general area surrounding the reservoir is characterized by gentle to moderate slopes that are heavily wooded. No signs of slope distress were observed (see Photograph 4).

5. Downstream Channel. Flow discharged into the stream beyond the embankment follows a course on moderate slopes through a heavily wooded area. Approximately 2 miles downstream, the tributary merges with Brush Creek, a stream with significantly less gradient. Approximately 500 feet upstream of the confluence, a recreational residence is located adjacent to the stream. The house did not appear to be occupied on a full-time basis. The first permanently occupied dwellings situated on the floodplain are located where PA State Route 56 crosses Brush Creek approximately 3.5 miles downstream of the dam (see Photograph 12). It is estimated that within this reach, approximately 6 to 20 people could be affected by an embankment breach.

3.2 Evaluation.

Observations made during the visual inspection suggest that the overall condition of the facility is excellent. The only difficiencies noted were minor seepage in the emergency spillway channel, an inadequately secured and questionably designed protective cage over the principal spillway drop inlet, and inadequate venting of the gate valve manhole. The condition of the protective cage is of most concern in that the consequences and costs of repair from possible vandalism (for example, if the inlet pipe were blocked with riprap) could be significant.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Normal Operational Procedure.

According to the owner's representative, there are no formal operational procedures at the facility. Excess inflow passes down through the principal spillway and is discharged into the stream below. Flows in excess of the principal spillway capacity are eventually discharged through the emergency spillway. The emergency spillway has not been utilized since the project has been in operation. The owner is required to maintain a minimum flow in the channel downstream of the embankment. This is achieved by means of a 3-inch diameter gate valve that serves as a by-pass of the main valve on the outlet conduit (see Figure 7). The flow is monitored automatically and continuously by a weir located approximately 100 to 150 feet beyond the discharge end of the outlet conduit (see Figure 1 and Photograph 10). Under the present procedure, the main valve on the outlet conduit is opened only when there is a need to draw-down the reservoir.

A separate water supply system operates independent of the outlet conduit (see Figures 1, 5 and 7). The system is utilized as-needed throughout the year (see Photograph 11).

4.2 Maintenance of Dam.

The dam is essentially a self-maintaining facility. Any routine maintenance required is performed by Oneida Mining Company personnel. The general appearance of the facility indicates no specific areas of neglect.

4.3 Maintenance of Operating Facilities.

There is no formal maintenance program for the operating facilities. The valves and pumping mechanisms associated with the water supply system are operated several times per year and consequently they receive regular maintenance. Valves associated with the outlet conduit are operated rarely and as a result, their condition becomes increasingly suspect with time.

4.4 Warning Systems.

There are no formal warning systems in effect.

4.5 Evaluation.

The facility is designed to be self-regulating and to require minimal maintenance. Formal procedures are recommended to ensure adequate maintenance and continued operability of the operating facilities.

SECTION 5
HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

The hydrologic/hydraulic design as presented in the design report was based on methods and standards set forth by the U. S. Department of Agriculture - Soil Conservation Service, and the U. S. Department of Interior - Bureau of Reclamation.

The designer assigned the facility a Class "C" classification. That is, the structure is located where failure may cause loss of life, serious damage to homes, industrial and commercial buildings, important utilities, main highways or railroads.

One-hundred year precipitation and PMP values were obtained from the "Rainfall Frequency Atlas of the United States," Technical Paper No. 40, U. S. Weather Bureau. Rainfall values used in developing the principal spillway hydrograph were obtained from the "Rainfall Frequency Atlas of the United States," Technical Paper No. 49, U. S. Weather Bureau.

The following criteria were established.

1. The riser crest of the principal spillway was set at elevation 1735.0. This provides 410 acre-feet of storage at normal pool elevation.

2. The 100-year frequency, 6-hour rainfall was routed through the reservoir. This rainfall of 4.1 inches resulted in a storage requirement of 100-acre-feet and set the crest of the emergency spillway at 1737.5.

3. An Emergency Spillway Hydrograph was routed through the reservoir and resulted in a maximum pool elevation of 1738.0 or a depth of flow in the emergency spillway of 6 inches.

4. The Freeboard Hydrograph utilized the 6-hour probable maximum precipitation of 25.5 inches. This storm routed through the reservoir resulted in a maximum spillway discharge of 1826 cfs at the top of the dam elevation 1744.0.

5.2 Experience Data.

Reservoir levels or spillway outlet conduit discharges are not recorded at this facility. Consequently, data relative to the past performance of the facility are not available. The owner's representative did indicate, however, that the emergency spillway has never discharged and the highest pool noted was approximately five inches above the crest of the principal spillway. The general appearance of the facility indicates adequate past performance.

5.3 Visual Observations.

On the date of the inspection, no conditions were observed that would suggest the appurtenant structures of the dam could not operate satisfactorily during a flood event.

5.4 Overtopping Potential.

The ratio "PMF Peak Flow/Drainage Area" was determined from an empirical curve supplied by the Corps of Engineers, Baltimore District. The curve used was the Ohio River Basin Curve. Based on this curve and a drainage area of 0.64 square miles, Peak PMF Q/A = 1,930 cfs/sq. mi., and Peak PMF Q = 1,235 cfs. The size category is "intermediate" and the hazard rating "high". Consequently, the SDF is the PMF.

Calculations were performed to evaluate the overtopping potential using spillway and storage capacities during the PMF (see Appendix C). The analysis determined that the maximum discharge capacity of the spillway is approximately equal to 1,595 cfs. A comparison of maximun discharge (1,819 cfs) with peak inflow (1,235 cfs) reveals the spillway capacity to be in excess of the peak inflow. Consequently, it is concluded that the facility is capable of discharging the inflow resulting from a storm of PMF magnitude.

5.5 Spillway Evaluation.

The facility is capable of discharging the inflow resulting from a storm of PMF magnitude. As a result, the spillway is deemed adequate.

SECTION 6
EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. Based on visual observations, the embankment appeared to be in excellent condition. No evidence of seepage, sloughing, or erosion of embankment materials were observed. The embankment crest road, upstream riprap slope and the crownvetch covered downstream are designed for minimal maintenance.

b. Appurtenant Structures.

1. Emergency Spillway. Some seepage was observed emanating from the rock floor of the emergency spillway. No flow determinations could be made due to obscuring vegetation; however, this condition is not considered to constitute a problem at this time.

2. Principal Spillway. The inlet to the principal spillway appeared to be in excellent condition. The cage protecting the inlet appears inadequately designed and was insecurely fastened to the concrete approach apron surrounding the inlet. This condition, however, does not affect the structural integrity of the spillway. This condition could lead to inadequate operation and/or blockage of the conduit should the cage become dislodged and permit entry of trash or should the facility be subjected to vandalism.

3. Outlet Conduit. The outlet end of the discharge conduit was observed to be in good condition. The only deficiency noted was the inability to safely enter the gate valve manhole without auxiliary breathing equipment or without first purging the air from the manhole shaft.

6.2 Design and Construction Techniques.

a. Dam. Available engineering data obtained from PennDER files indicate the facility has been adequately designed and constructed in conformance with modern accepted engineering practices. Many of these features are proven designs which have previously been incorporated into similar structures.

6.3 Past Performance.

According to Mr. Bruce Bufalini, engineer with Oneida Mining Company, Inc., the facility has functioned satisfactorily throughout its brief history.

6.4 Seismic Stability.

The dam is located in Seismic Zone No. 1 and it is thought that the static stability of the structure is sufficient to withstand minor earthquake induced dynamic forces. In addition, an earthquake coefficient of 0.05 was used throughout the extensive stability analyses performed by L. Robert Kimball, the design engineer.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The visual inspection, operational history, and available engineering data suggest that the facility is in excellent condition.

The project is capable of passing the flow resulting from a storm of PMF magnitude without overtopping the dam; therefore, the emergency spillway is considered adequate.

b. Adequacy of Information. The available information is considered adequate to make a Phase I assessment of this facility.

c. Urgency. The studies and remedial measures listed below should be carried out as soon as possible.

d. Necessity for Additional Investigations. No additional investigations are deemed necessary at this time.

7.2 Recommendations/Remedial Measures.

It is recommended that:

a. Formal procedures be established with regard to maintenance of the facility. The owner should consider installing an extended stem on the blow-off pipe valve to facilitate operations during emergency conditions and routine maintenance checks.

b. The design of the protective cage over the principal spillway be reviewed in light of the consequences of possible loss of anchorage and/or vandalism.

c. A warning system be developed to provide for the notification of downstream inhabitants should the need arise. The program should include round-the-clock surveillance during periods of intense or prolonged rainfall.

d. Oneida Mining Company personnel continue to monitor the observation wells on a yearly basis and report any noticeable changes in water levels to their design engineer for evaluation. The condition of the seepage in the emergency spillway channel should also be addressed and changes in flow rate or turbidity reported.

APPENDIX A

CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Oneida Mining Co. Dam

ID # NDI#PA-830, PennDER #32-79

ITEM	REMARKS	SHEET 1

AS-BUILT DRAWINGS

Design drawings contained in PennDER files. "As-built" drawings reportedly available at the Oneida Mining Company, however, these drawings were not available during the inspection.

REGIONAL VICINITY MAP

U.S.G.S. 7.5-minute series, Brush Valley Quadrangle, see Appendix G.

CONSTRUCTION HISTORY

None available.

TYPICAL SECTIONS OF DAM

See Appendix F, Figure 6 (Dwg. 7 of 11, "Cross-Section").

OUTLETS - PLAN See Appendix F, Figure 5 (Dwg. 3 of 11, "Outlet Works").

- DETAILS See Appendix F, Figure 7 (Dwg. 4 of 11, "Outlet Works Detail").

- DISCHARGE RATINGS Contained within design report, Part II "Hydrologic and Hydraulic Analysis."

RAINFALL/RESERVOIR RECORDS Daily rainfall records and/or reservoir level records are not compiled at this facility.

DESIGN REPORTS

Two-volume design report entitled "Engineering Report for Earthfill Dam for a Water Storage Reservoir at Mine No. 4, Indiana County, Pennsylvania." Volume I (Design Report) is available from PennDER. Volume II (Construction Specifications) is reportedly available from the owner but could not be located for a review by the inspection team.

GEOLOGY REPORTS

Contained within the design report, Volume I.

DESIGN COMPUTATIONS
HYDROLOGY & HYDRAULICS
DAM STABILITY
SEEPAGE STUDIES

Contained within the design report, Volume I.

MATERIALS INVESTIGATIONS
BORING RECORDS
LABORATORY
FIELD

Contained within the design report, Volume I, and also displayed on the drawings, see Appendix F, Figures 2, 4 and 6 (Dwgs. 1 and 7 of 11).

POST-CONSTRUCTION SURVEYS OF DAM

"As-Built" drawings reportedly available from owner. Owner also surveys crest annually. Data not available during inspection interview.

BORROW SOURCES

Borrow materials were derived from the core cutoff trench excavation and the emergency spillway excavation. Clay core materials were secured from residual soils within the impoundment area (see Appendix F, Figure 2).

MONITORING SYSTEMS

See Appendix F, Figures 5, 8 and 9 (Dwgs. 3, 6 and 11 of 11).

MODIFICATIONS

None

HIGH POOL RECORDS

No formal records are available. Maximum pool, according to the owner's representative was approximately 5 inches above the crest of principal spillway and occurred in July 1977. (estimated pool elevation 1735.5)

POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS

Weekly inspection reports available from Oneida Mining Company, are prepared and filed to assure the facility meets MESA requirements. Inspections are performed by Mr. Jones and/or Mr. Bufalini (Oneida personnel) who are certified by MESA to perform the inspections.

PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS

None

MAINTENANCE OPERATION RECORDS

There are no formal maintenance or operation programs in effect at this facility. Records of regular operations or routine maintenance are not kept for this facility.

ITEM	REMARKS	ID # NDI# PA-830	SHEET 4

SPILLWAY PLAN — See Appendix F, Figure 3 (Dwg. 3 of 11, "Emergency Spillway").

SECTIONS — See Appendix F, Figure 3 (Dwg. 3 of 11, "Emergency Spillway").

DETAILS — See Appendix F, Figure 3 (Dwg. 3 of 11, "Emergency Spillway").

OPERATING EQUIPMENT PLANS & DETAILS

See Appendix F, Figures 5 and 7 (Dwgs. 3 and 4 of 11).

NDI# PA-830
ID # PennDER# 32-79

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 0.64 square miles

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): EL 1735.0 (410 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): EL 1737.5 (510 acre-feet)

ELEVATION MAXIMUM DESIGN POOL: EL 1739.0 (580 acre-feet)

ELEVATION TOP DAM: EL 1744.0 (800 acre-feet)

SPILLWAY DATA:

PRINCIPAL

a. Crest Elevation 1735
b. Type A 48-inch diameter crest with a 30-inch diameter drop inlet.
c. Crest Length 48-inch diameter
d. Channel Length Not applicable
e. Location Spillover Upstream near left abutment
f. Number and Type of Gates None

EMERGENCY

a. Crest Elevation 1737.5
b. Type Vegetated trapezoidal channel
c. Crest Length 30 feet at base
d. Channel Length ≈ 450 feet
e. Location Spillover Right abutment
f. Number and Type of Gates None

OUTLET WORKS:

a. Type 24-inch diameter low level conduit
b. Location Left of embankment center
c. Entrance Inverts 1705.0
d. Exit Inverts 1695.0
e. Emergency Draindown Facilities 24-inch diameter gate valve located near the base of the center of the embankment and is accessible via a manhole atop the embankment crest

HYDROMETEOROLOGICAL GAGES:

a. Type Weir and recorder to monitor minimum flow requirements
b. Location ≈ 150 downstream of dam
c. Records Weekly charts from owner

MAXIMUM NON-DAMAGING DISCHARGE: ≈ 5 inches over the principal spillway in July 1977

APPENDIX B

CHECK LIST - VISUAL INSPECTION

CHECK LIST
VISUAL INSPECTION
PHASE 1

DAM NAME Oneida Mining Co., Inc. COUNTY Indiana STATE PA ID # NDI #PA-830

TYPE OF DAM Earth HAZARD CATEGORY High

DATE(S) INSPECTION Sept. 26, 1978 WEATHER Clear & Sunny TEMPERATURE 60-70°

POOL ELEVATION AT TIME OF INSPECTION 1731.3 M.S.L. TAILWATER AT TIME OF INSPECTION N/A M.S.L.

INSPECTION PERSONNEL:

B. M. Mihalcin (GAI)		Oneida Mining Co., Inc.
J. P. Nairn (GAI)		Bruce Bufalini (Engineer)
D. L. Bonk (GAI)		
S. R. Michalski (GAI)		

B. M. Mihalcin RECORDER

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed. The downstream and upstream slopes are protected by crown vetch and limestone riprap layers, respectively. The crest is covered with a layer of gravel that protects it against damage from occasional vehicle traffic.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal - Good. Vertical - cambered ≈ 3 feet.	
RIPRAP FAILURES	None observed. Riprap is durable limestone. Below normal pool riprap is undersized (6" max.) but functioning well. Above normal pool riprap is well graded (2' to 3' max. diameter). Discussions with the owner's representative indicate that the supply of larger riprap material was discovered, during construction, to have been overestimated, consequently, the smaller material was used as a substitute.	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS

JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM

Good condition.

ANY NOTICEABLE SEEPAGE

Minor seepage through base of emergency spillway ≈ 100 feet downstream of the dam centerline. Flow could not be measured due to vegetative cover.

STAFF GAGE AND RECORDER

None.

DRAINS

Several relief wells. All water levels were observed within the wells to be at or below the ground surface.

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	
STAFF GAGE OF RECORDER:	N/A	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None observed.	
INTAKE STRUCTURE	Submerged.	
OUTLET STRUCTURE	Concrete structure in excellend condition.	
OUTLET CHANNEL	Eight- to 10-foot wide rock-lined channel, unobstructed.	
EMERGENCY GATE	Gate valve in manhole structure located on the crest of the dam just left of center.	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR		
N/A.		
APPROACH CHANNEL		
Excavated in weathered rock at the right abutment.		
DISCHARGE CHANNEL		
Trapezoidal-shaped channel cut in weathered rock and 30 feet wide at the base. Side slopes are lined with riprap to a point approximately 5 feet above the channel floor.		
BRIDGE AND PIERS		
None.		

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Excellent condition at inlet. Protective cage over the prinicpal spillway is loosely attached.	
APPROACH CHANNEL	Circular concrete sill.	
DISCHARGE CHANNEL	Principal spillway conduit ties into blow-off conduit near the embankment center. Both lines utilize a common outlet that discharges into an 8- to 10-foot wide trapezoidal channel.	
BRIDGE AND PIERS	None.	

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS

MONUMENTATION/SURVEYS

Two settlement plates are located along the line of maximum section between the downstream toe and the crest of the embankment.

OBSERVATION WELLS

Eight observation wells or standpipes, spaced at 50-foot intervals, are located along the downstream rock toe. In addition, there are three additional standpipes, two on the downstream slope and one on the embankment crest.

WEIRS

One 90° V-notch weir is located about 100 to 150 feet downstream of the outlet structure.

PIEZOMETERS

Eight pneumatic piezometers are located on the line of maximum section between the downstream toe and the crest of the embankment.

OTHERS

There are two slope indicator casings installed on the embankment near the line of maximum section between the downstream toe embankment crest.

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gentle to moderate around reservoir, heavily wooded. No evidence of slope distress was observed.	
SEDIMENTATION	None observed.	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Wooded natural channel immediately beyond the embankment, with no apparent obstructions.	
SLOPES	Moderate within 1 mile of dam becoming moderate to steep. Approximately 2 miles downstream, the stream joins Brush Creek. The Brush Creek channel valley is broad with much less gradient than the tributary leading to the dam.	
APPROXIMATE NO. OF HOMES AND POPULATION	Approximately 500 feet upstream of the confluence, a recreational residence is located approximately adjacent to the stream. The house did not appear to be occupied on a full-time basis. The first permanently occupied dwellings situated on the floodplain are located where PA Route 56 crosses Brush Creek approximately 3.5 miles downstream of the dam (see Photograph 12).	
	It is estimated that within this reach, approximately 6 to 20 people could be affected by an embankment breach.	

APPENDIX C

HYDROLOGY AND HYDRAULICS

SUBJECT DAM SAFETY INSPECTION
IEIDA MINING COMPANY DAM

BY EJM DATE 10-17-78 PROJ. NO. 78-501-830

CHKD. BY DLB DATE 10-26-78 SHEET NO. 1 OF 10

gai CONSULTANTS, INC.
Engineers • Geologists • Planners
Environmental Specialists

DAM STATISTICS

MAX. HEIGHT - 50.0 FT. (FIELD DETERMINED)

DRAINAGE AREA - 0.64 SQ MI (REF 2, PG 216)
(VERIFIED BY PLANIMETERING THE DRAINAGE AREA FROM THE 7.5' SERIES MARLETON NJAU USGS MAP)

STORAGE CAPACITY - 510 AC-FT @ ELEV 1737.5 [CREST OF EMERGENCY SPILLWAY]
410 AC-FT @ ELEV 1735 [CREST OF SERVICE SPILLWAY]
(REF 2 PP 211-212)

SIZE CLASSIFICATION

SIZE CLASSIFICATION - INTERMEDIATE (REF. 3, TABLE 1)

HAZARD RATING - HIGH (FIELD OBSERVATION & REF 3, TABLE 2)

REQUIRED SDF - PMF (REF 3, TABLE 3)

REFERENCES:

1. L. ROBERT KIMBALL CONSULTING ENGINEERS, "CONSTRUCTION DRAWINGS FOR EARTHFILL DAM FOR A WATER STORAGE RESERVOIR AT MINE NO. 4, INDIANA COUNTY, PENNSYLVANIA", L. ROBERT KIMBALL CONSULTING ENGINEERS, EBENSBURG, PENNSYLVANIA, JULY, 1973, 12 PAGES.

2. L. ROBERT KIMBALL CONSULTING ENGINEERS, "ENGINEERING REPORT FOR EARTHFILL DAM FOR A WATER STORAGE RESERVOIR AT MINE NO. 4, INDIANA COUNTY, PENNSYLVANIA", L. ROBERT KIMBALL CONSULTING ENGINEERS, EBENSBURG, PENNSYLVANIA, JULY, 1973,

SUBJECT DAM SAFETY INSPECTION
ONEIDA MINING COMPANY DAM

BY EJM DATE 10-17-79 PROJ. NO. 79-501-830

CHKD. BY DLB DATE 10-26-79 SHEET NO. 2 OF 10

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$\frac{PMF\ (PEAK\ FLOW)}{AREA} = 1930\ \frac{CFS}{MI^2}$ REF: CORPS OF ENGINEER CURVE, OHIO RIVER BASIN

LET PMF (PEAK FLOW) BE DENOTED BY: PMF $Q \equiv Q_{i\,MAX}$

$\Rightarrow$ PMF $Q \equiv Q_{i\,MAX} = (1930\ \frac{CFS}{MI^2})(0.64\ MI^2)$

PMF $Q = Q_{i\,MAX} = 1235.20.\ \frac{FT^3}{S}$

REFERENCES: (CONT'D)

3. "RECOMMENDED GUIDELINES FOR SAFETY INSPECTION OF DAMS", DEPARTMENT OF THE ARMY, OFFICE OF THE CHIEF ENGINEERS, APPENDIX D

4. FRANZINI, J.B, AND LINSLEY, R. K., WATER-RESOURCES ENGINEERING, Mc GRAW HILL BOOK COMPANY, 2ND EDITION, 1972.

5. CHOW, V. T., OPEN-CHANNEL HYDRAULICS, Mc GRAW HILL BOOK COMPANY, 1959.

SUBJECT DAM SAFETY INSPECTION
ONEIDA MINING COMPANY DAM

BY EJM DATE 10-17-78 PROJ. NO. 78-501-830

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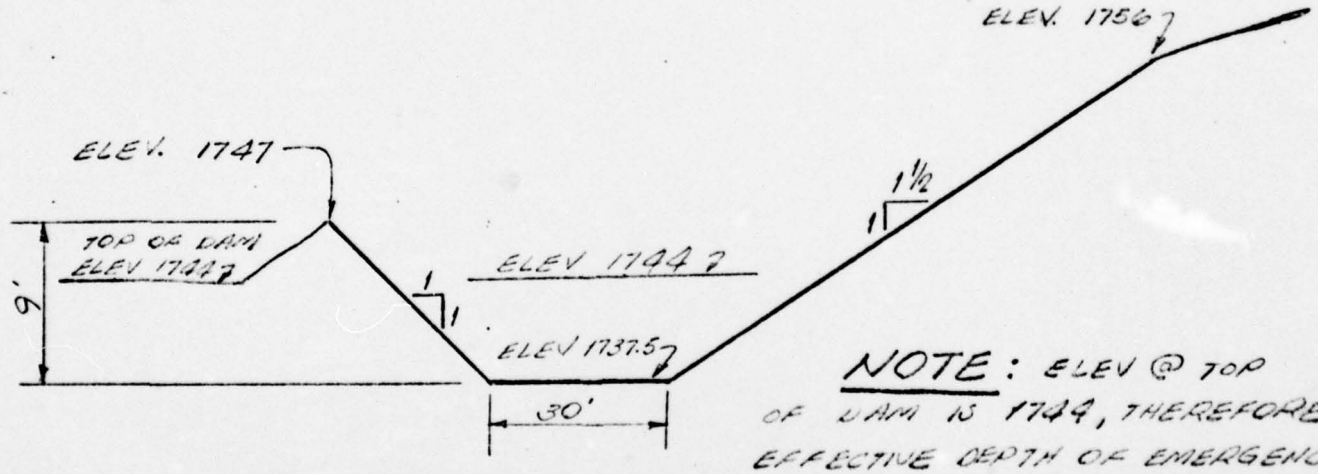
CAPACITY OF EMERGENCY SPILLWAY

THE EMERGENCY SPILLWAY IS A GRASS LINED EARTHEN TRENCH HAVING THE CROSSECTION SHOWN BELOW:



NOTE: ELEV @ TOP OF DAM IS 1744, THEREFORE EFFECTIVE DEPTH OF EMERGENCY SPILLWAY IS 6.5'

TYPICAL CROSS-SECTION OF EMERGENCY SPILLWAY

NOT TO SCALE

ALL ELEVATIONS, DETAILS, AND DIMENSIONS ARE TAKEN FROM REF 1, DWG 6 OF 11, AND HAVE BEEN FIELD VERIFIED.

FIG. 1

SUBJECT DAM SAFETY INSPECTION
ONEIDA MINING COMPANY DAM

BY EJM DATE 10-17-78 PROJ. NO. 78-501-830

CHKD. BY DLB DATE 10-26-78 SHEET NO. 4 OF 10

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IN DETERMINING THE CAPACITY OF THE EMERGENCY SPILLWAY, THE FOLLOWING SIMPLIFYING ASSUMPTIONS APPLY:

1. THE MAXIMUM DEPTH OF FLOW IN THE SPILLWAY IS 6.5 FT. AT ELEVATION 1744 WHICH IS EQUAL TO THE CREST ELEVATION (DISREGARDING CAMBER)

2. THE GRASS LINING IS CONSISTENT THROUGHOUT THE CHANNEL LENGTH, THEREFORE THE ROUGHNESS COEFFICIENT IS UNIFORM

3. THE CHANNEL SIDE SLOPES ARE CONSISTENT OVER THE ENTIRE LENGTH

4. THE CHANNEL SLOPE AT THE ENTRANCE IS 1.0% (REF 1 DWG 2 OF 11)

5. FLOW IS TURBULENT AND THE MANNING EQUATION APPLIES

MANNING EQUATION:

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$ (REF 4 PG 272)

WHERE: Q - QUANTITY OF FLOW (CFS)
n - ROUGHNESS COEFFICIENT
A - AREA OF FLOW (FT^2)
S - SLOPE OF CHANNEL ($\frac{FT}{FT}$)
R - HYDRAULIC RADIUS (FT)
WP - WETTED PERIMETER (FT)

$$R = \frac{A}{WP}$$

SUBJECT DAM SAFETY INSPECTION / ONEIDA MINING COMPANY DAM

BY EJM DATE 10-17-78 PROJ. NO. 78-515-830

CHKD. BY DLB DATE 10-26-78 SHEET NO. 5 OF 10

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$n = 0.030$ (REF 5, pg 112)

$A = (30')(6.5) + \frac{1}{2}(6.5)(6.5) + \frac{1}{2}(9.75')(6.5)$
$= 247.8\ FT^2$

$WP = 9.19' + 11.72' + 30.0'$
$= 50.91\ FT$

} REF: DIMENSIONS FROM FIGURE 1 pg. 9.

$R = \frac{A}{WP} = \frac{247.8\ FT^2}{50.91\ FT}$

$= 4.87\ FT$

$S = 1.0\%$ OR $0.01\ \frac{FT}{FT}$ (pg 4)

$Q = \frac{1.49}{0.030}(247.8\ FT^2)(4.87\ FT)^{2/3}(0.01\ \frac{FT}{FT})^{1/2}$

$Q = 3536\ \frac{FT^3}{S}$

SUBJECT DAM SAFETY INSPECTION
ONEIDA MINING COMPANY DAM
BY EJM DATE 10-17-78 PROJ. NO. 78-501-530
CHKD. BY DLB DATE 10-26-78 SHEET NO. 6 OF 10

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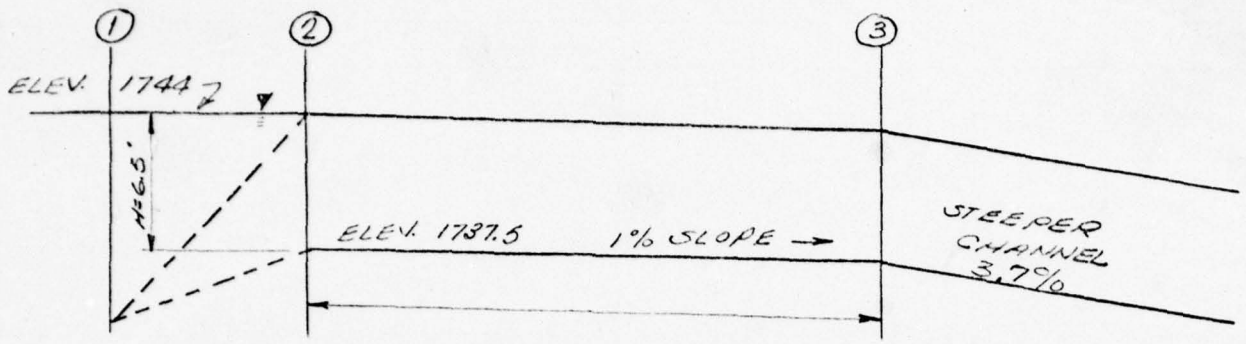
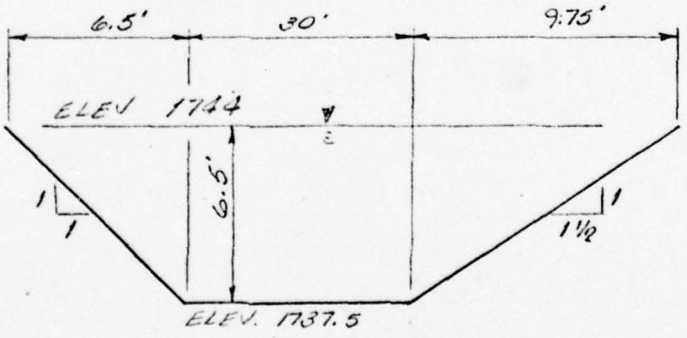


ALL ELEVATIONS, DETAILS, AND DIMENSIONS ARE TAKEN FROM REF 1, DWG 2 OF 11, AND HAVE BEEN FIELD VERIFIED

LONGITUDINAL SECTION THROUGH EMERGENCY SPILLWAY

NOT TO SCALE



CROSS-SECTION THROUGH EMERGENCY SPILLWAY

NOT TO SCALE

FIGURE 2

SUBJECT DAM SAFETY INSPECTION
ONEIDA MINING COMPANY DAM

BY EJM DATE 10-17-78 PROJ. NO. 78-501-830

CHKD. BY DLB DATE 10-26-78 SHEET NO. 7 OF 10

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ASSUME FLOW IS SUPERCRITICAL i.e. FLOW PASSES THROUGH CRITICAL DEPTH AT SECTION ②

SPECIFIC ENERGY HEAD IS THEN:

$$H_s = Y + \frac{V^2}{2g}$$ (REF 5, pg 41)

AT SECTION ①, V IS NEGLIGIBLE ⇒ $H_s = H = 6.5'$

AT SECTION ②, $H_s = Y_c + \frac{V_c}{2g}$ (SUBSCRIPT "c" IS FOR CRITICAL FLOW)

$$\Rightarrow Y_c + \frac{V_c^2}{2g} = 6.5$$

AT CRITICAL DEPTH $\frac{V^2}{2g} = \frac{D_c}{2}$ (REF 5, pg 43)

WHERE D_c = HYDRAULIC DEPTH = $\frac{\text{AREA}}{\text{TOP WIDTH}} = \frac{A_c}{W_c}$ (REF 5, pg 23)

$$A_c = 30Y_c + 0.5(1.5Y_c)(Y_c) + 0.5(Y_c)(Y_c)$$
$$= 30Y_c + 1.25Y_c^2$$

$$W_c = 30 + 1.5Y_c + Y_c$$
$$= 30 + 2.5Y_c$$

SUBJECT DAM SAFETY INSPECTION
ONEIDA MINING COMPANY DAM

BY ELM DATE 10-17-78 PROJ. NO. 78-501-830

CHKD. BY DLB DATE 10-26-78 SHEET NO. 8 OF 10

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$$Y_c + \frac{30Y_c + 1.25Y_c^2}{2(30 + 2.5Y_c)} = 6.5$$

$$Y_c + \frac{30Y_c + 1.25Y_c^2}{60 + 5Y_c} = 6.5$$

$$60Y_c + 5Y_c^2 + 30Y_c + 1.25Y_c^2 = 390 + 32.5Y_c$$

$$6.25Y_c^2 + 57.5Y_c - 390 = 0$$

$$Y_c = \frac{-57.5 + \sqrt{(-57.5)^2 - 4(6.25)(-390)}}{2(6.25)}$$

$$Y_c = \frac{-57.5 + 114.26}{12.50}$$

$\Rightarrow Y_c = 4.54$ FT THEREFORE THE CRITICAL DEPTH OCCURS BEFORE THE DAM IS OVERTOPPED OR AT ELEV. 1742

$$\frac{V_c^2}{2g} = \frac{30Y_c + 1.25Y_c^2}{2(30 + 2.5Y_c)} = \frac{30(4.54) + 1.25(4.54)^2}{2(30 + 2.5(4.54))}$$

$$\frac{V_c^2}{2g} = 1.96$$

$\Rightarrow V_c = 11.23$ FPS

SUBJECT DAM SAFETY INSPECTION
ONEIDA MINING COMPANY DAM

BY DLB DATE 10-17-78 PROJ. NO. 78-501-830

CHKD EJM DATE 10-26-78 SHEET NO. 9 OF 10

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$A_c = 30(4.54) + 1.25(4.54)^2 = 161.96 \text{ FT}^2$

Q_c = CRITICAL DISCHARGE = $V_c A_c = (11.23 \text{ FT/SEC})(161.96 \text{ FT}^2)$

$Q_c = 1819 \text{ CFS}$

FIND: SLOPE REQUIRED TO CONVEY THIS FLOW AT NORMAL DEPTH ⇒ DETERMINE THE CRITICAL SLOPE

$$Q_c = \frac{1.49}{n} A_c R_c^{2/3} S_c^{1/2} \qquad \text{(MANNING'S EQ)}$$

$$R_c = \frac{\text{AREA OF FLOW}}{\text{WETTED PERIMETER}} = \frac{161.96}{(4.54 + 30 + 6.81)} = 3.92 \text{ FT}$$

$n = 0.030$ (SHEET 5)

$A_c = 161.96 \text{ FT}^2$ (SHEET 9)

$Q_c = 1819 \text{ FT}^3/\text{SEC}$

$$1819 = \frac{1.49}{0.030}(161.96)(3.92)^{2/3}(S_c)^{1/2}$$

$$1819 = 14998.5 \ (S_c)^{1/2}$$

$S_c = 0.008$

CRITICAL SLOPE (0.008) < ACTUAL SLOPE (0.01)

∴ SUPERCRITICAL FLOW WILL OCCUR

SUBJECT DAM SAFETY INSPECTION
ONEIDA MINING COMPANY DAM
BY DLB DATE 10-17-78 PROJ. NO. 78-501-830
CHKD. BY EJM DATE 10-26-78 SHEET NO. 10 OF 10

CONSULTANTS, INC.
Engineers • Geologists • Planners
Environmental Specialists

THEREFORE THE CRITICAL FLOW (Q_c) IS LESS THAN FLOW OBTAINED FROM MANNING'S FORMULA (pg 5)

$Q_c = 1819 < 3536 = Q$

THEREFORE SPILLWAY CAPACITY IS

$Q_{SPILLWAY} \simeq 1819$ CFS

THEREFORE SPILLWAY IS ADEQUATE, i.e. $Q_{i\,MAX} < Q_{SPILLWAY}$

$Q_{i\,MAX} = 1235 cfs < Q_{SPILLWAY} = 1819$ CFS

APPENDIX D

PHOTOGRAPHS

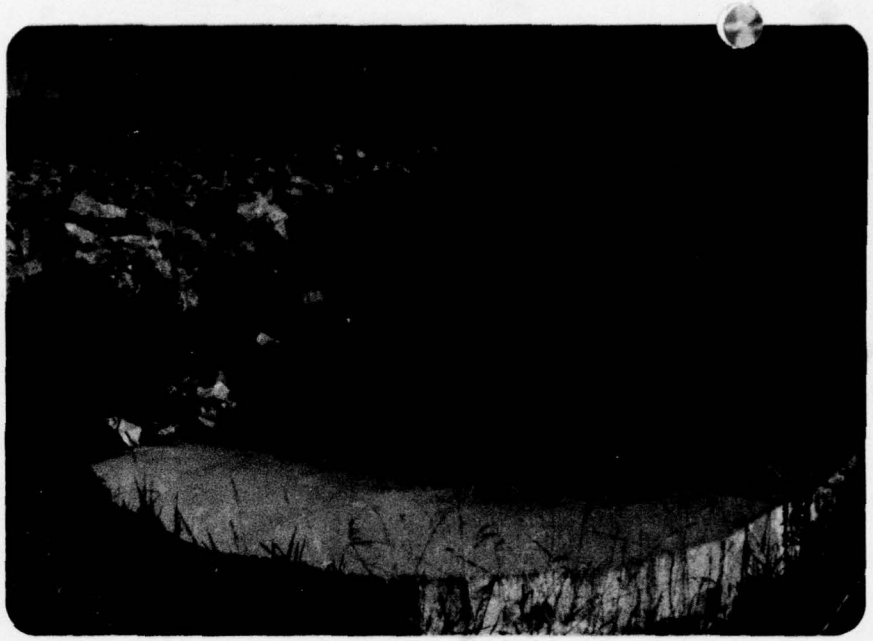
PHOTOGRAPH 1 View looking north along the crest of the embankment. The emergency spillway excavation can be seen on the far side of the dam.

PHOTOGRAPH 2 Detail showing the 30-inch diameter principal spillway riser on the left abutment. Normal pool is the top of the black zone of riprap on the upstream slope.

PHOTOGRAPH 3 View looking west at the area immediately downstream of the embankment as seen from the embankment crest.

PHOTOGRAPH 4 View looking east at the reservoir and the watershed area above the dam.

1



2

3

4

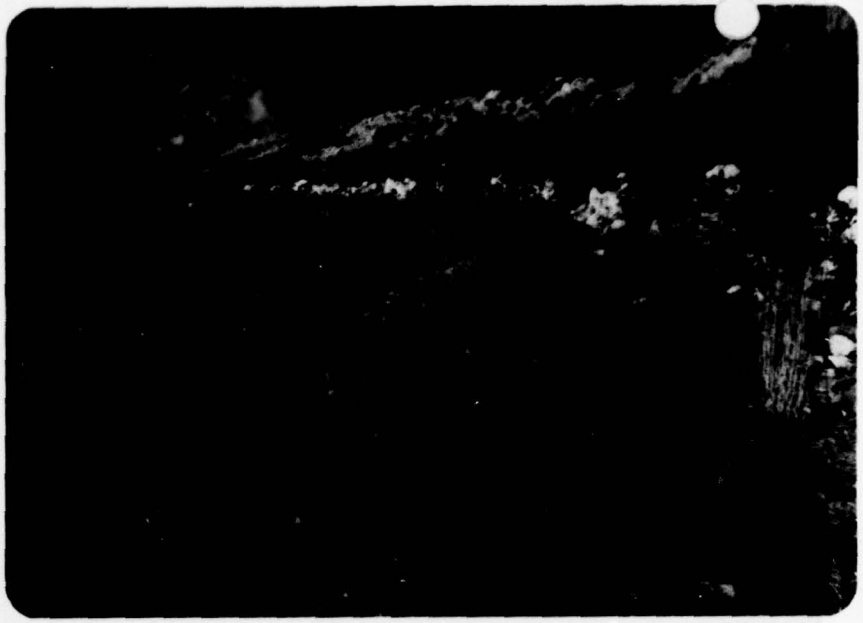
PHOTOGRAPH 5 View along the crest of the embankment looking north. The top of the mahhole leading to the 24-inch gate valve is just right of center. Terminals for piezometers, settlement pads and slope indicators can be seen in the background just above center.

PHOTOGRAPH 6 Looking northwest along the forebay area of the emergency spillway. A five-foot high riprap channel liner was installed on both sides of the spillway.

PHOTOGRAPH 7 View looking southwest along the downstream end of the emergency spillway channel. The rock-lined channel on the right is part of a runoff diversion system installed on the right abutment above the emergency spillway.

PHOTOGRAPH 8 View looking south along the downstream toe of the embankment. Relief wells and observation wells can be seen extending along the toe of the slope.

5



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7

8

PHOTOGRAPH 9 Detailed view showing the outlet structure. The observed iron precipitate is apparently due to an increase in the pH of the discharge water and/or bacterial action in the downstream channel.

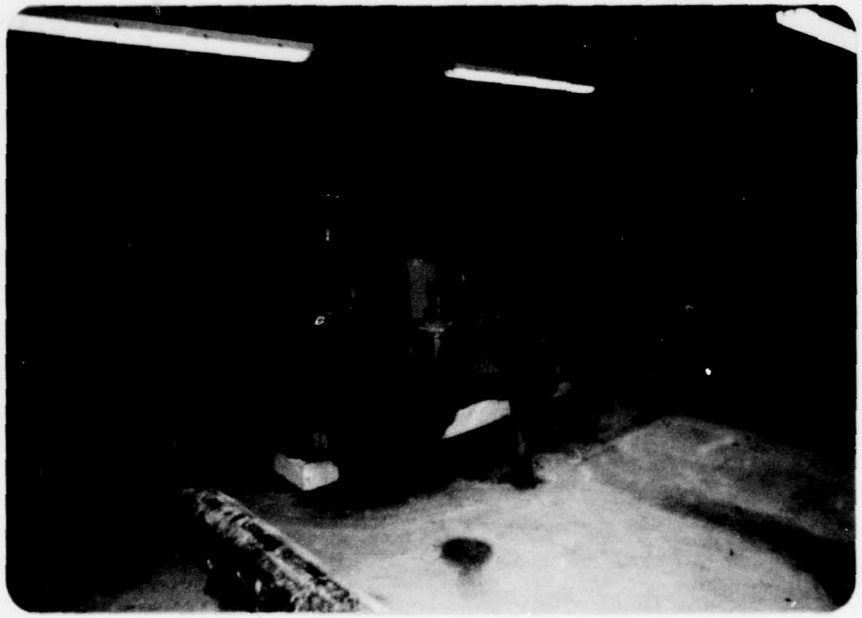
PHOTOGRAPH 10 View of downstream weir and automatic staff gage located about 100 feet downstream of the outlet wingwall.

PHOTOGRAPH 11 Interior of the pump house. Water enters the pumphouse via two 12-inch lines and is pumped to the mine complex for conditioning.

PHOTOGRAPH 12 This view shows two dwellings located on the floodplain approximately 3 miles downstream of the embankment. Brush Creek passes beneath State Route 56 through a box culvert just right of center.

9

10



11

12

APPENDIX E

GEOLOGY

Geology*

The Oneida Mining Company, Inc., Dam is located approximately 40 miles west of the Allegheny Topographic Front within the Allegheny Mountain Section of the Appalachian Plateau Province. The Allegheny Mountain section is characterized by gently folded sedimentary rock strata of Pennsylvanian age. Major structural axes strike from southwest to northeast with flanking strata dipping northwest and southeast.

The dam site is located on the northwest flank of the Nolo Anticline. The anticlinal axis strikes about N30°E with the rock strata dipping northwest at approximately 2° to the axis of the Brush Valley syncline northwest of the dam site.

The Oneida Mining Company, Inc., operates a deep mine in the Lower Kittanning Coal, locally known as the "B" seam which lies approximately 280 feet beneath the embankment. No deep mining of the "B" seam beneath the dam and reservoir area is planned.

During exploratory drilling, a one-foot thick coal seam was encountered on the right abutment at approximate elevation 1722. No attempt was made by the designer to identify

*Portions of this section have been taken from the "Engineering Report for Earthfill Dam for a Water Storage Reservoir at Mine No. 4, Indiana County, Pennsylvania," prepared for Oneida Mining Company, Inc., Seward, Pennsylvania, prepared by L. Robert Kimball, Consulting Engineers, Ebensburg, Pennsylvania, July 1973.

this coal horizon. The interval between this coal horizon and the "B" seam is approximately 305 feet based on isopach data supplied by Oneida Mining Co., Inc. Referring to the "Generalized Stratigraphic Section for the Greater Pittsburgh Region," Pennsylvania Topographic and Geologic Survey, 1974, the interval between the "B" seam and the Brush Creek Coal is approximately 295 feet. Therefore, it is concluded that the thin coal seam encountered on the right abutment during exploratory drilling is the Brush Creek Coal and that the sandstone strata encountered 50 feet beneath the deepest section of the embankment is most likely the Lower Mahoning sandstone. Furthermore, the Upper Freeport Coal horizon would occur approximately 75 feet beneath the deepest section of the embankment. This stratagraphic interpretation places the bedrock at the site well within the Conemaugh Group rather than in the Allegheny Group as indicated in L. Robert Kimball's engineering report. The significance of this difference in geologic interpretation is that the engineering report implies the Upper Freeport Coal horizon lies above the embankment, whereas interpreting the site stratigraphy as part of the Conemaugh Group places the Upper Freeport Coal beneath the site. In either case, however, the Upper Freeport Coal is currently not mined in the vicinity of the dam and reservoir.

The soil types at the impoundment site have a wide variation-ranging from clays to silts to sands. In the valley floor the soil overburden is composed of thick alluvial deposits consisting of dominantly silty clay to

clay silt with extensive pockets of silt sand, gravelly sand and gravelly clay. The sides of the valley are blanketed with residual soils developed from a shale and sandstone bedrock. The bedrock below the alluvial deposits of the valley bottom is sandstone. The lower to middle slopes of the stream valley have shales underlying the soil overburden. The upper portion of the valley slopes and the ridges are held up by resistant sandstones.

The groundwater varies in depth from 1-40 feet. It is essentially an artesian flow at an average depth of 30 feet. The groundwater encountered was artesian in 90 percent of the test borings. It is apparently being suppressed by the clays and silts above the 30-foot depth in the valley bottom and flowing from between the clays and silts and bedrock off the surrounding ridges. The discharge from test borings varied from 1-30 gpm with a steady flow established at about 10 gpm.

APPENDIX F

FIGURES

LIST OF FIGURES

SUBJECT Oneida Mining Co., Inc. Dam

BY GRM DATE 10-16-78 PROJ. NO. 78-501-830

CHKD. BY DLB DATE 10-28-78 SHEET NO. 1 OF 1

GAI CONSULTANTS, INC.

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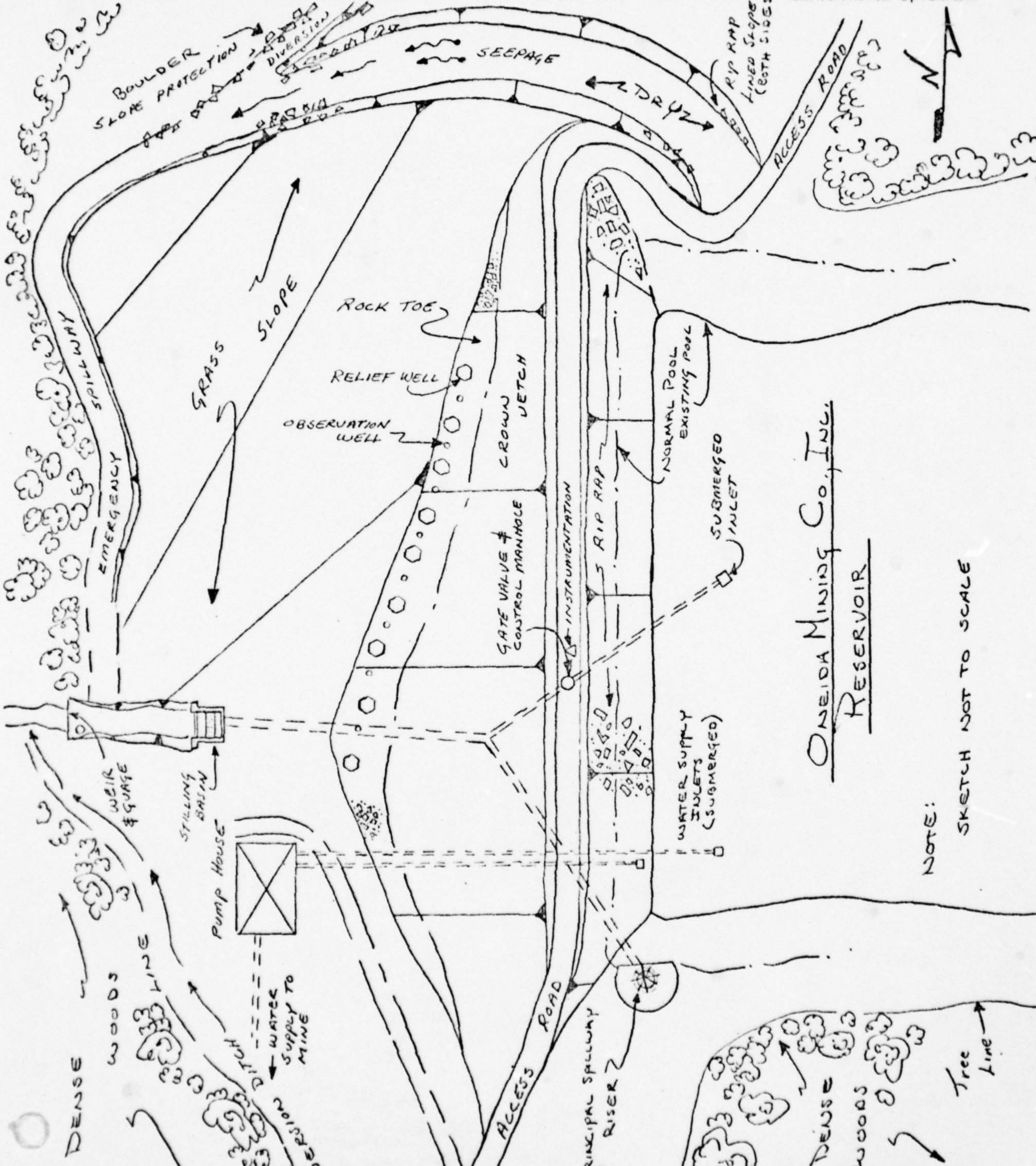
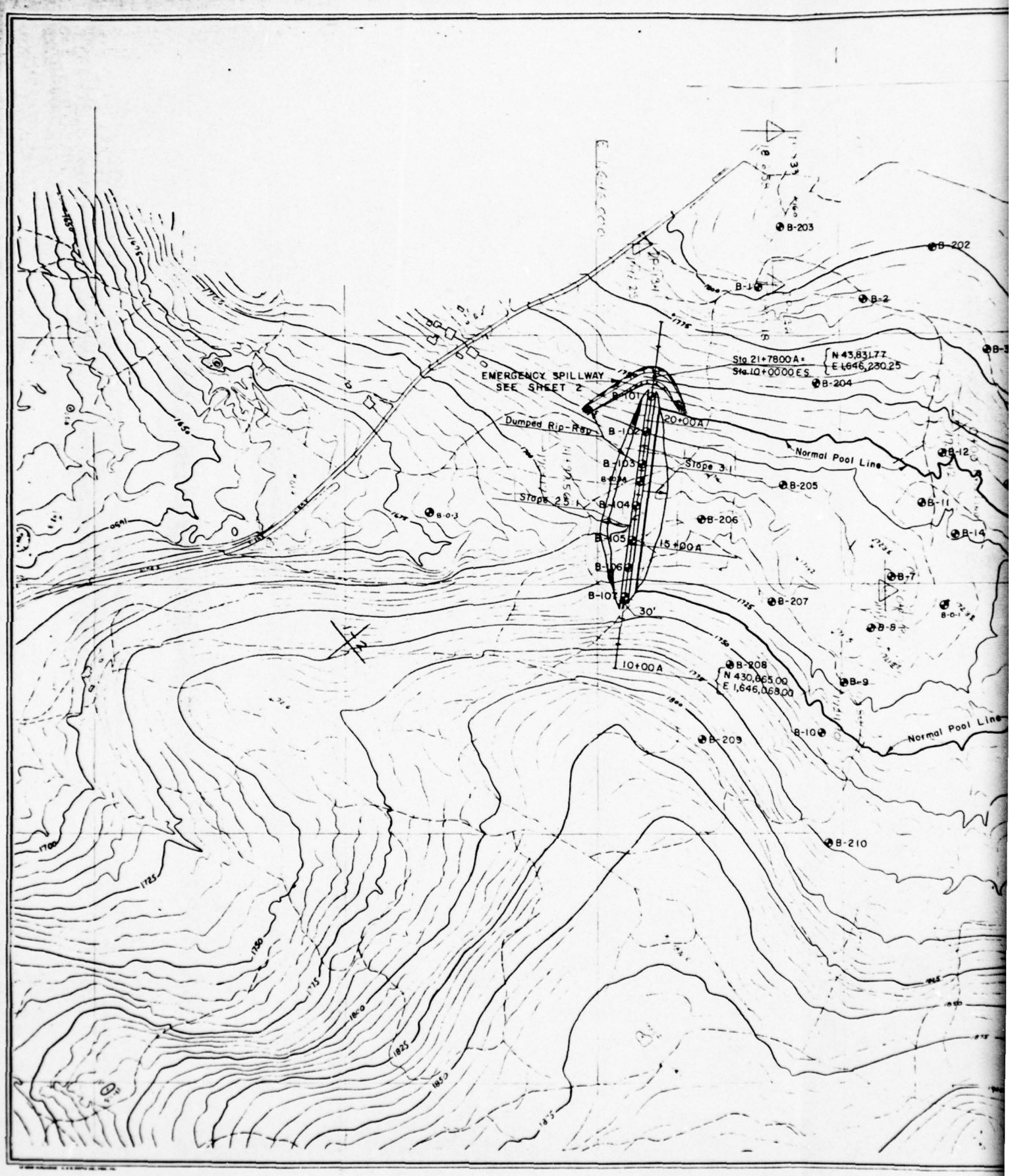


FIGURE 1


EMERGENCY SPILLWAY
SEE SHEET 2
Sta 21+7800A =
Sta.10+0000ES
N 43,831.77
E 1,646,230.25
Dumped Rip-Rap
20+00A
15+00A
10+00A
30'
Slope 3:1
Slope 2.5:1
Normal Pool Line
Normal Pool Line
B-101
B-102
B-103
B-104
B-105
B-106
B-107
B-1
B-2
B-202
B-203
B-204
B-205
B-206
B-207
B-208
N 430,865.00
E 1,646,068.00
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B-9
B-10
B-11
B-12
B-14

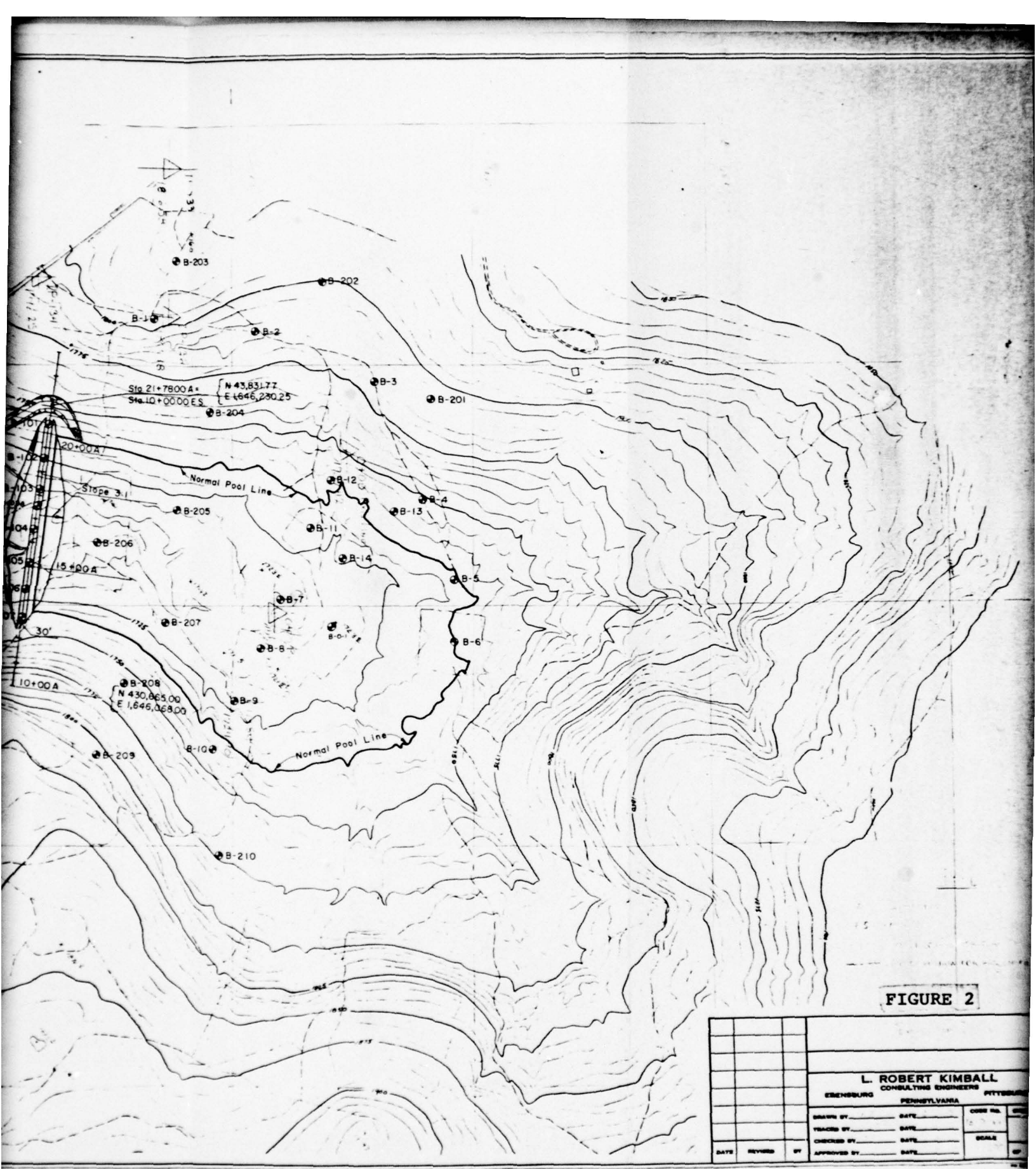
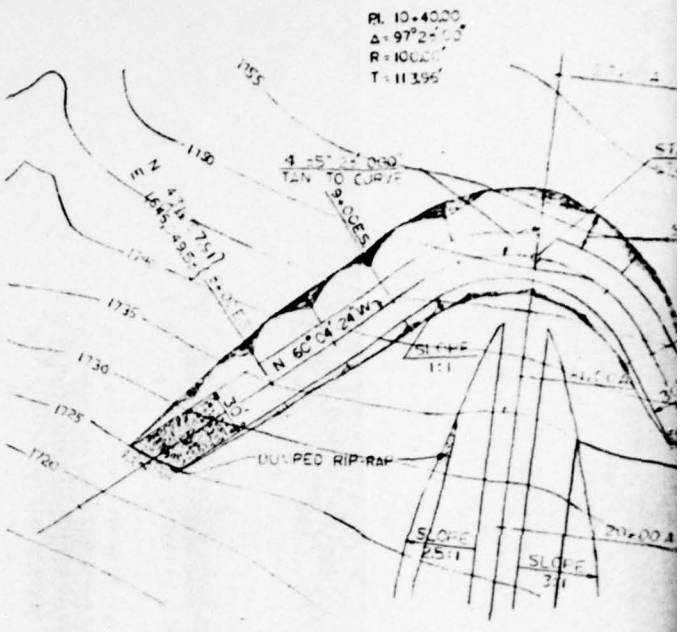


FIGURE 2

L. ROBERT KIMBALL
CONSULTING ENGINEERS
EBENSBURG PENNSYLVANIA PITTSBURGH

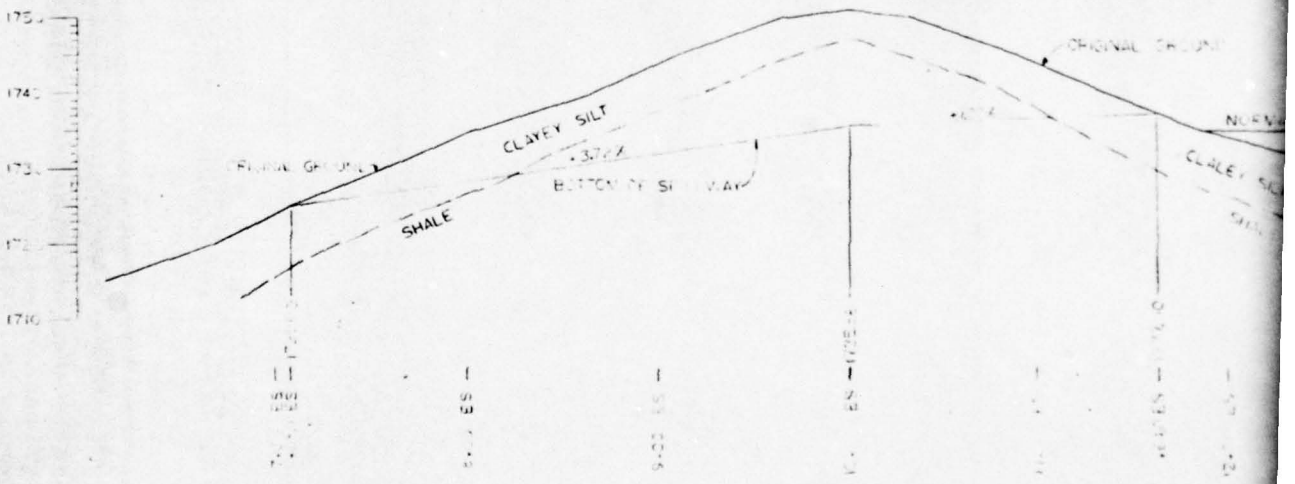
DATE	REVISED	BY

DRAWN BY _____ DATE _____
TRACED BY _____ DATE _____
CHECKED BY _____ DATE _____
APPROVED BY _____ DATE _____
CODE NO.
SCALE

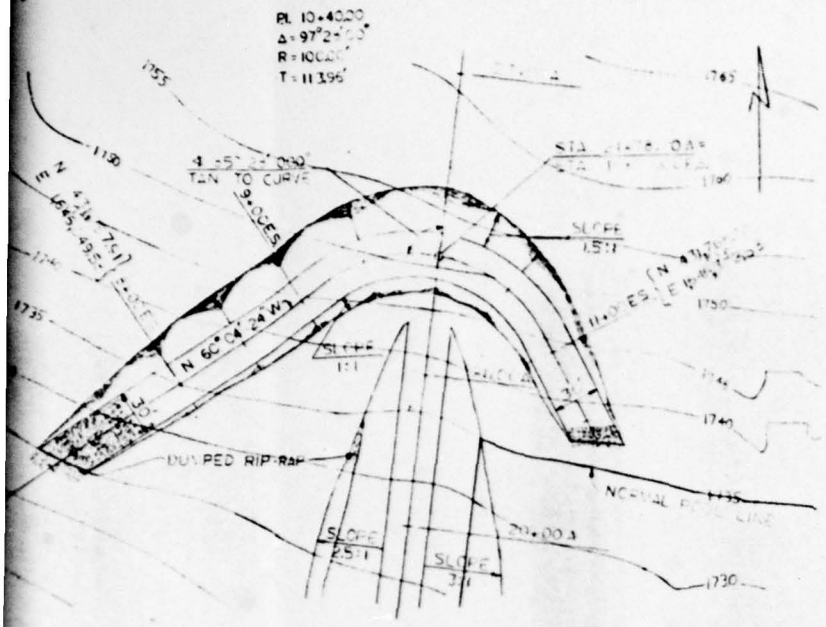


PLAN OF PIPE-END STRUCTURE

SCALE 1"=50'



PROFILE



PLAN OF EMERGENCY SPILLWAY

SCALE: 1" = 50'

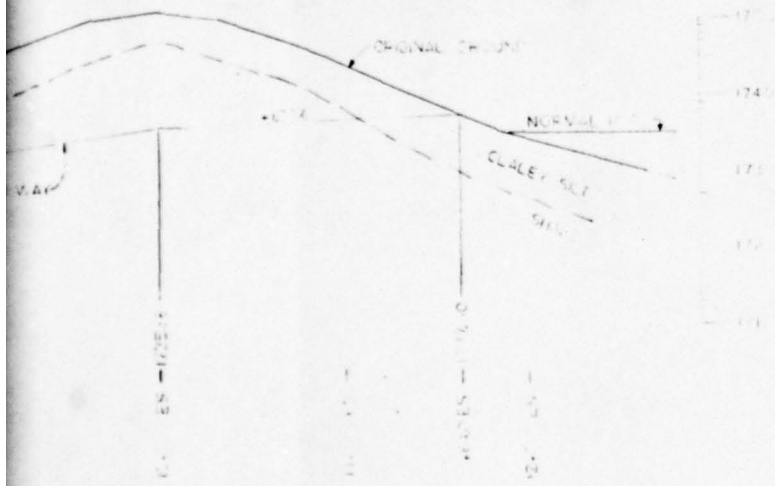
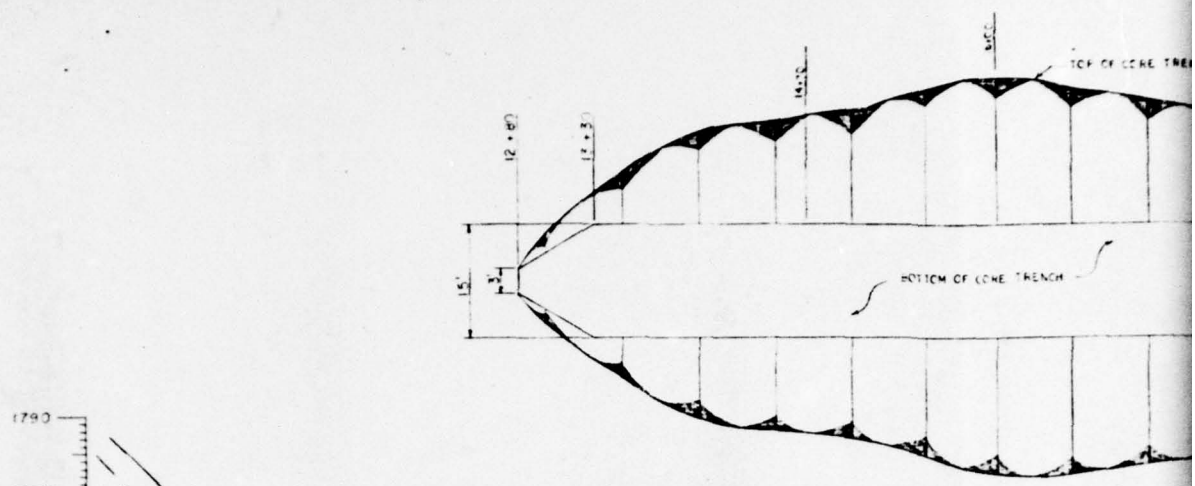


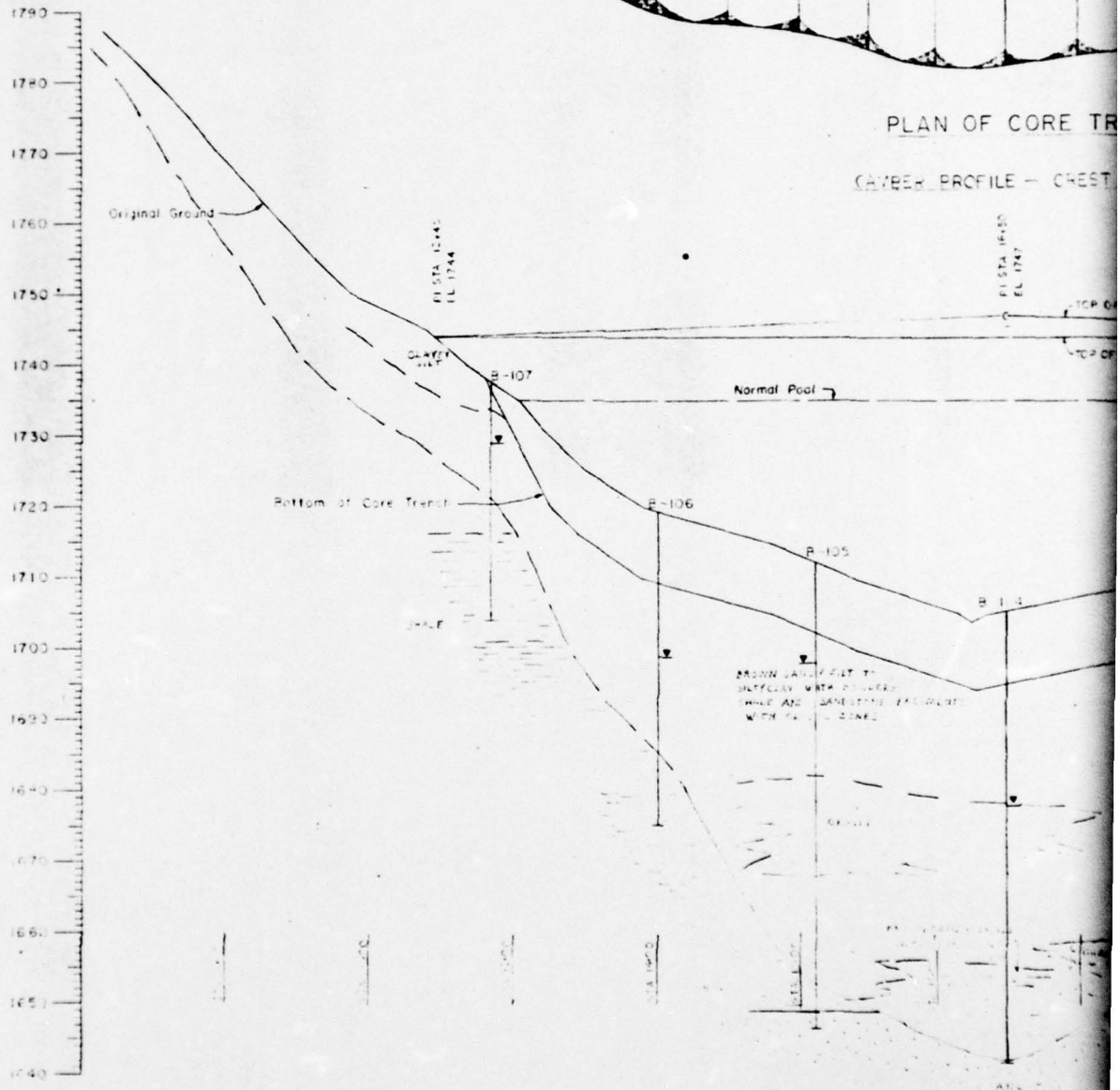
FIGURE 3

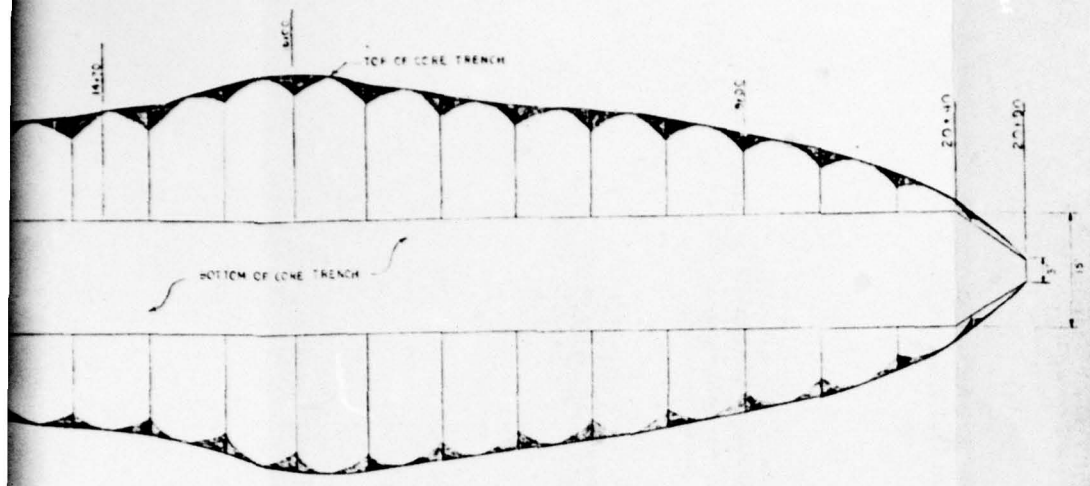
			ONEIDA MINE NO. 4 WATER STORAGE DAM DESIGN ONEIDA MINING CO. INDIANA CO., PA.
			EMERGENCY SPILLWAY
			L. ROBERT KIMBALL CONSULTING ENGINEERS EBENSBURG PENNSYLVANIA PITTSBURGH
			DRAWN BY ___ DATE 8-9-77 · TRACED BY CTP DATE 8-9-77 · CHECKED BY ___ DATE 8-11-77 · APPROVED BY ___ DATE 8-12-77 · CODE NO. 77-04-N · SCALE 1" = 50' · SHEET NO. 2 · OF 11
DATE	REVISED	BY	



PLAN OF CORE TR

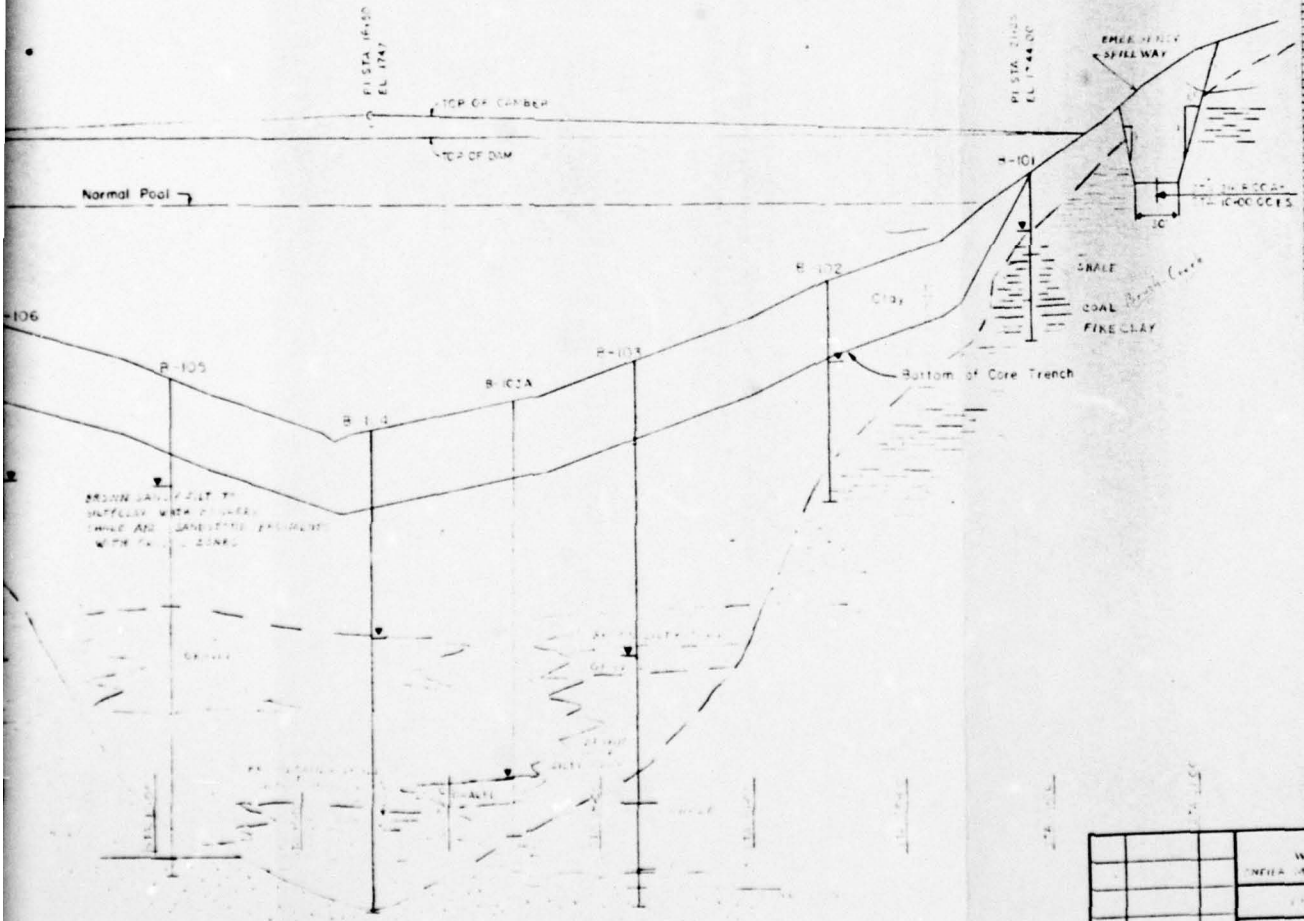
CAVER PROFILE — CREST





PLAN OF CORE TRENCH

CAMBER PROFILE — CREST OF DAM



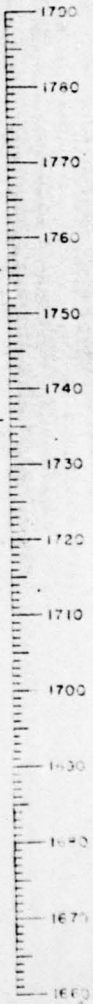


FIGURE 4

DATE	REVISED	BY

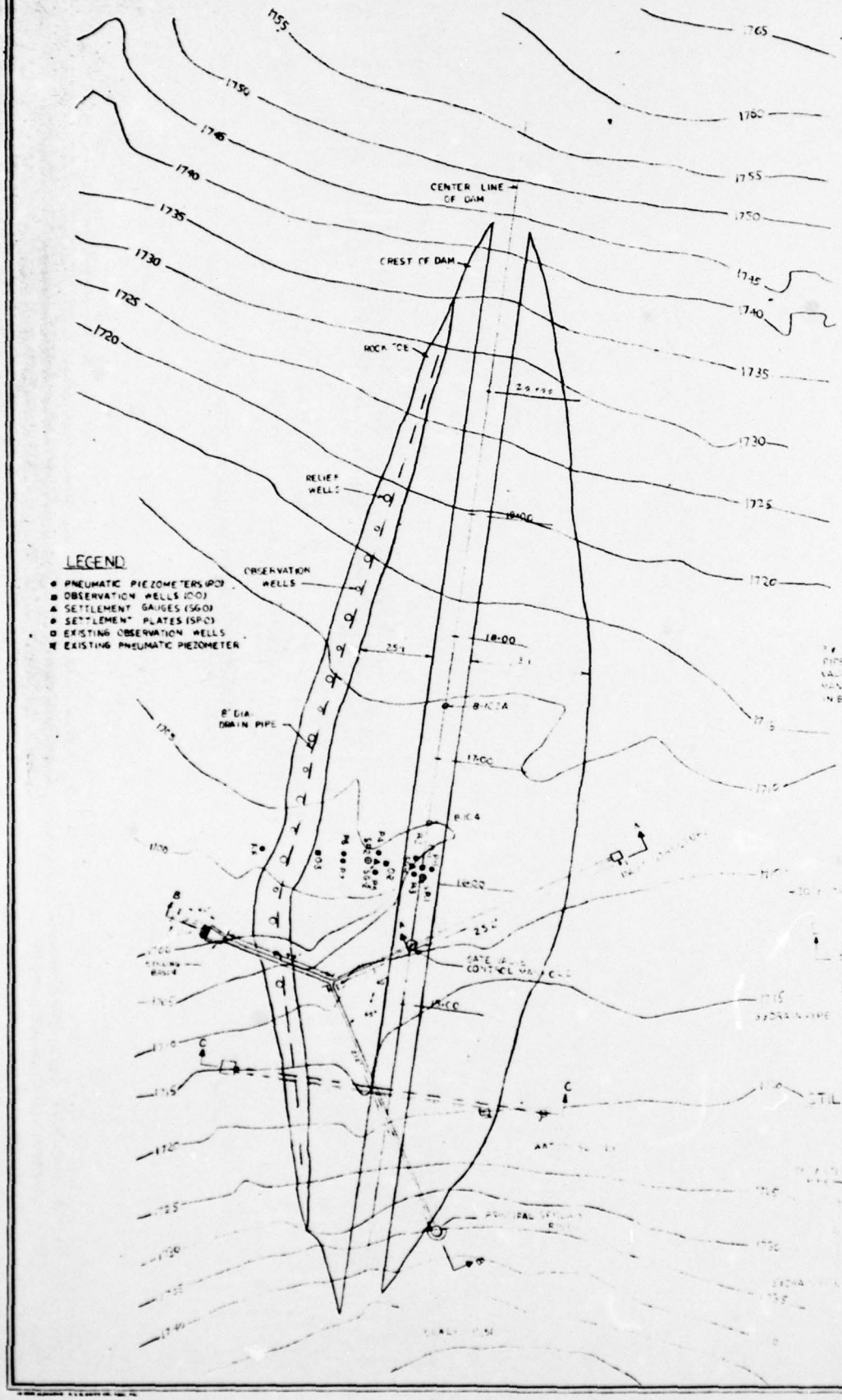
DAM NO. 4
WATER SUPPLY DAM — DESIGN
INDIA MINING CO. TAZEWELL CO., VA.

CL FILE ALTO. AXIS OF DAM

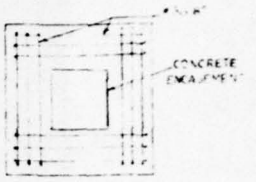
L. ROBERT KIMBALL
CONSULTING ENGINEERS
EBENSBURG PENNSYLVANIA PITTSBURGH

DRAWN BY ... DATE 6-5-73
TRACED BY ... DATE ...
CHECKED BY ... DATE ...
APPROVED BY ... DATE ...

CODE NO. 73-...
SCALE HOR. 1"=... VERT. 1"=...
SHEET NO. 5
OF 11



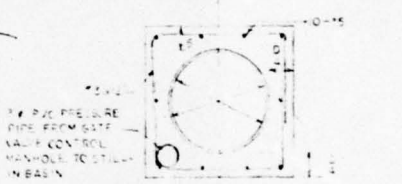
PLAN

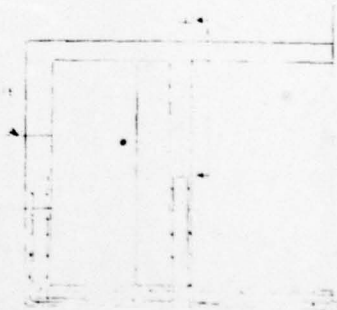


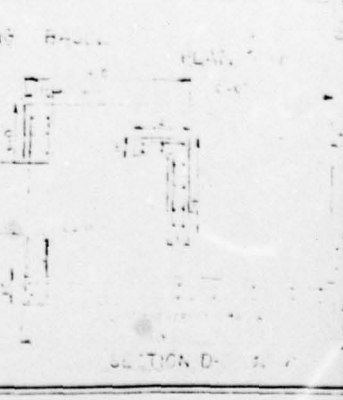
END VIEW

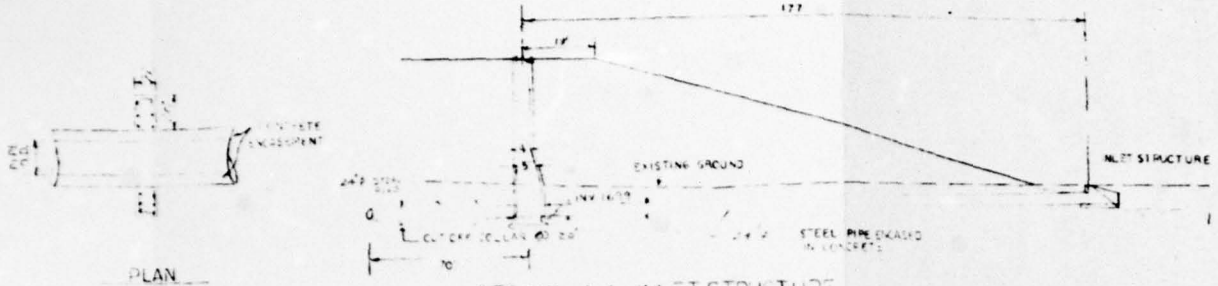
CUT OFF COLLAR DETAILS

NO SCALE

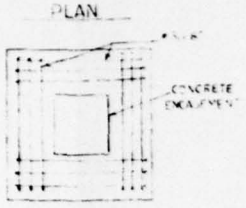




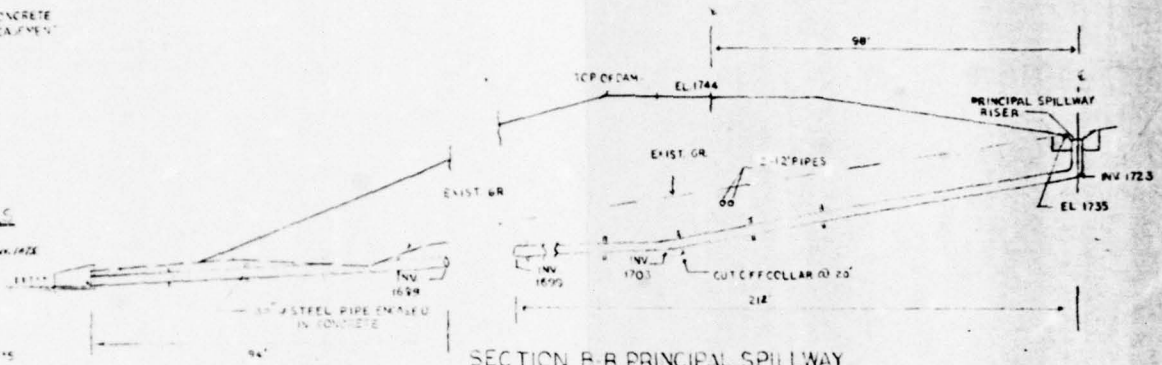




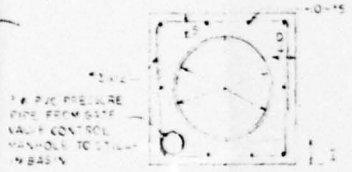
SECTION A-A INLET STRUCTURE

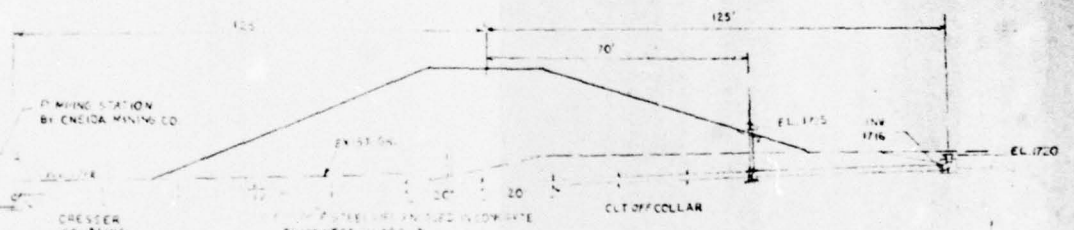


END VIEW
CUT OFF COLLAR DETAILS
NO SCALE



SECTION B-B PRINCIPAL SPILLWAY





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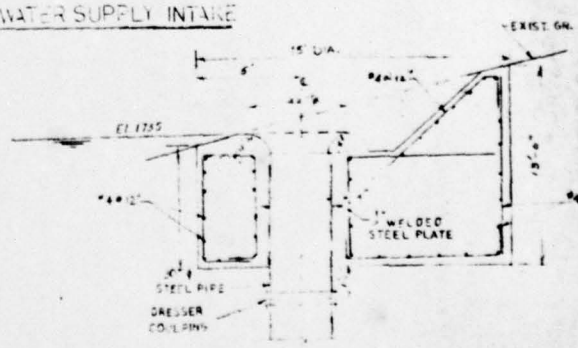
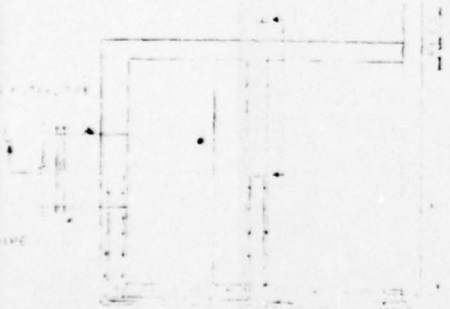
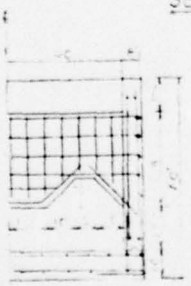
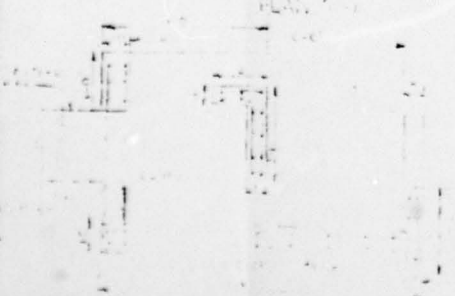




STILLING BASIN
PLAN



SECTION E-E



SECTION D-D

NOTE:

PRINCIPAL SPILLWAY RISER DETAILS

NO.	REVISION	BY
5	SPILLWAY BASIN	RVV
4	CUT OFF COLLARS	RVV
3	ENCASED PIPE	RVV
2	MISC. CHAN.	
1		

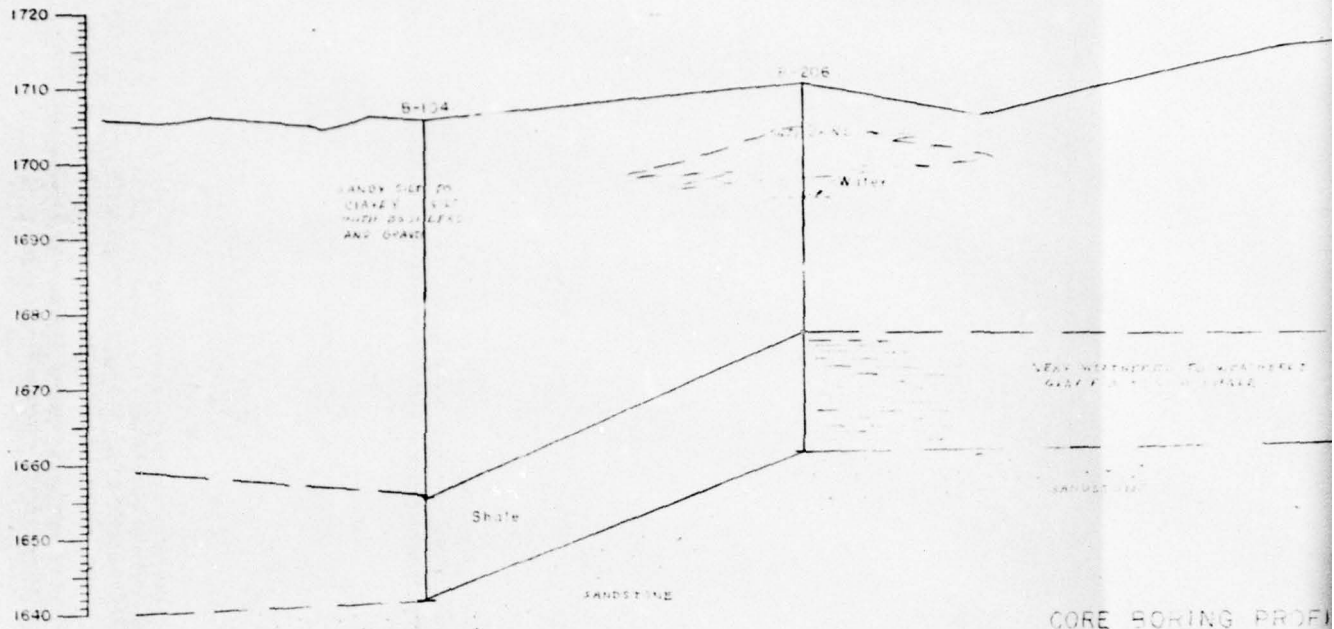
ONEIDA MINE NO. 4
WATER STORAGE DAM DESIGN
ONEIDA MINING CO. INDIANA CO. PA.

OUTLET WORKS

L. ROBERT KIMBALL
CONSULTING ENGINEERS
EBENSBURG PITTSBURGH
PENNSYLVANIA

DRAWN BY R.V.V.	DATE 6-5-77	CODE NO.	SHEET NO.
TRACED BY R.V.V.	DATE 6-9-77		3
CHECKED BY A.W.	DATE 6-13-77	SCALE AS NOTED	OF 11
APPROVED BY S.W.	DATE 6-14-77		

FIGURE 5



CORE BORING PROFI

Scale
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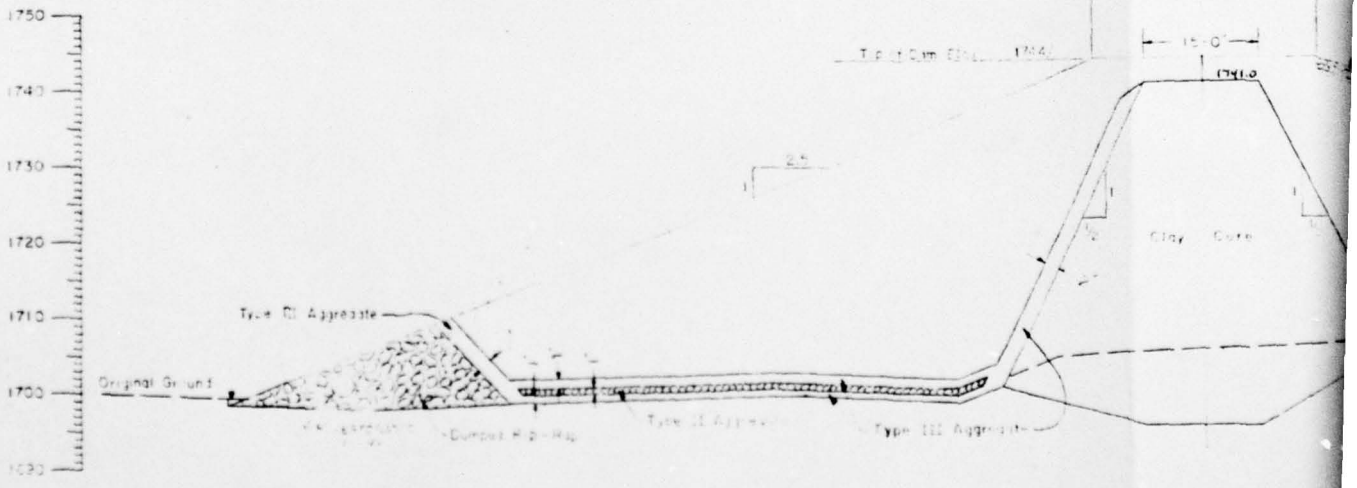
Vert. 1"=10'



TYPICAL DA

CORE BORING PROFILE

Scale

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Vert. 1"=10'

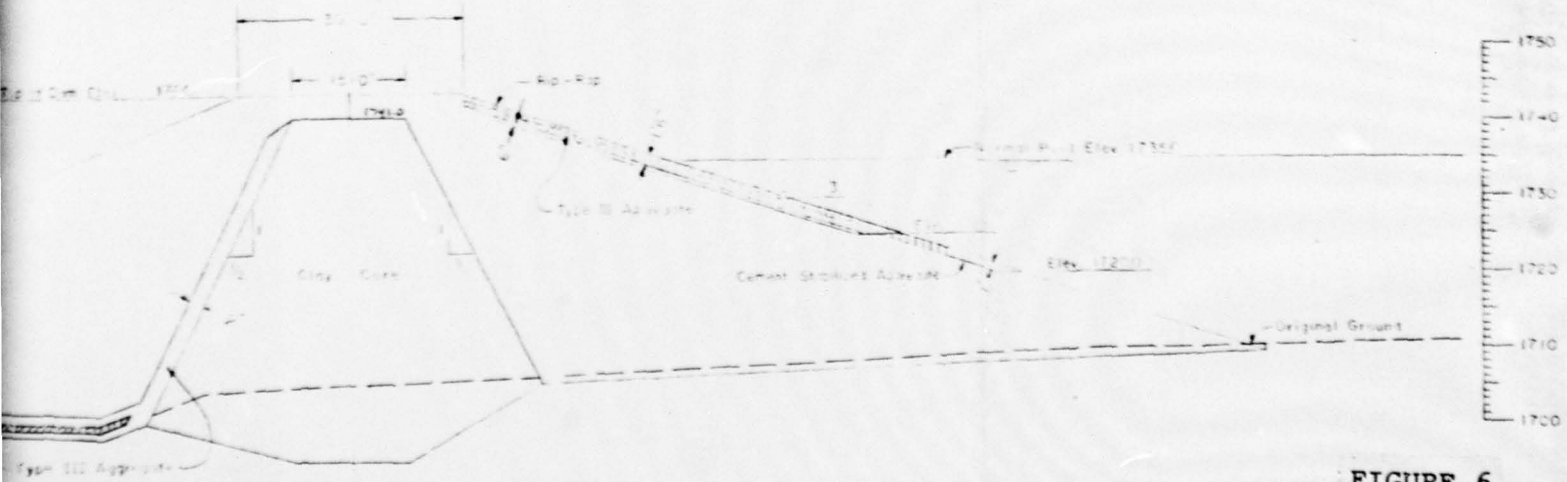

FIGURE 6

ONEIDA MINE NO. 4

ONEIDA MINING CO. INDIANA CO., PA.

CROSS-SECTION

L. ROBERT KIMBALL

CONSULTING ENGINEERS

EBENSBURG PENNSYLVANIA PITTSBURGH

DATE	REVISED	BY

DRAWN BY ____ DATE ____

TRACED BY ____ DATE ____

CHECKED BY ____ DATE ____

APPROVED BY ____ DATE ____

CODE NO. 73-0-804

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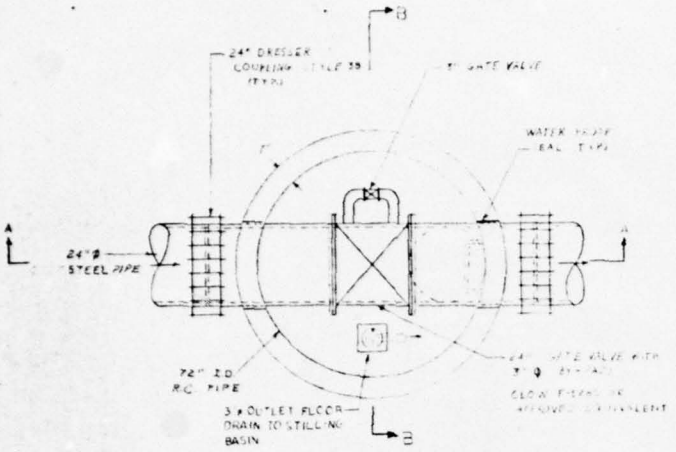
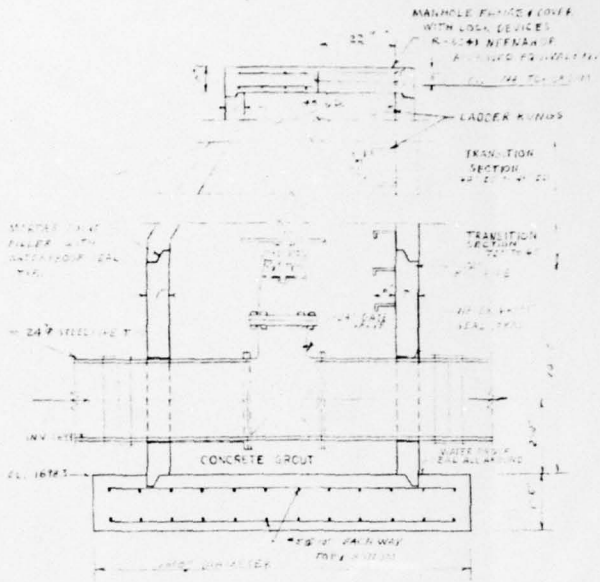
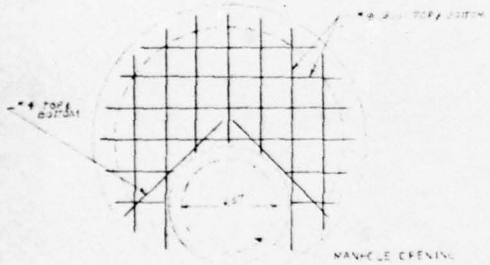


PLAN

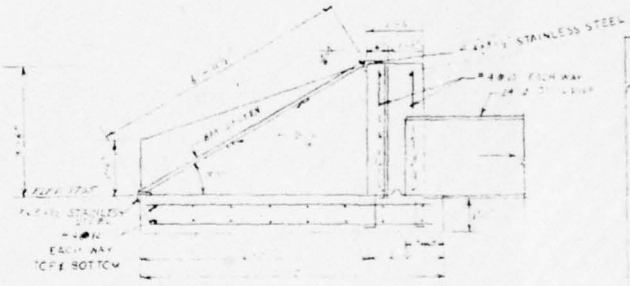
GATE VALVE CONTROL MANHOLE

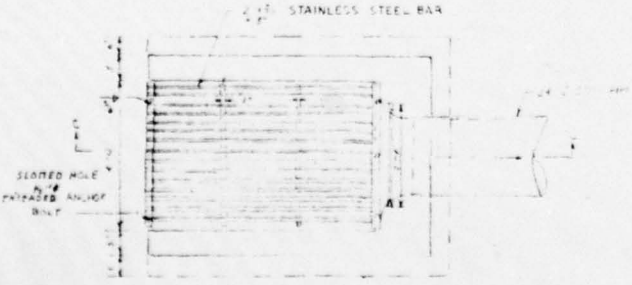


SECTION A-A

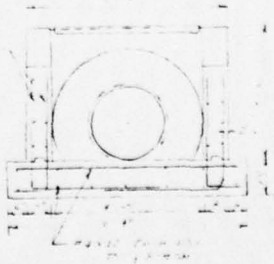


TOP SLAB

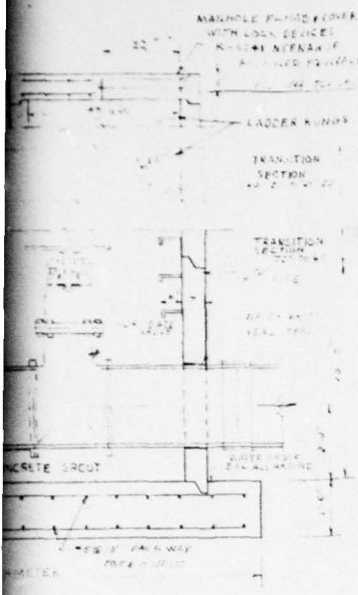




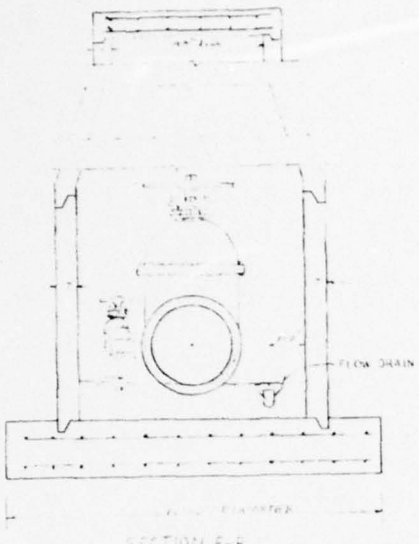
INLET PLAN



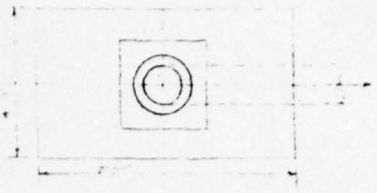
SECTION CL



SECTION A-A

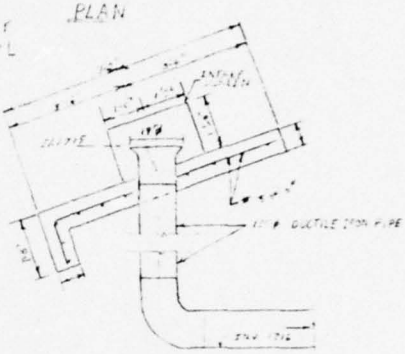


SECTION B-B

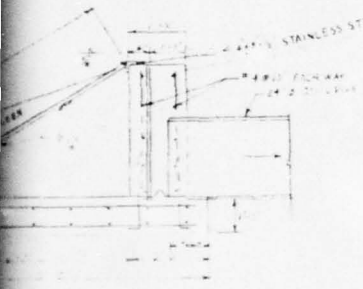


PLAN

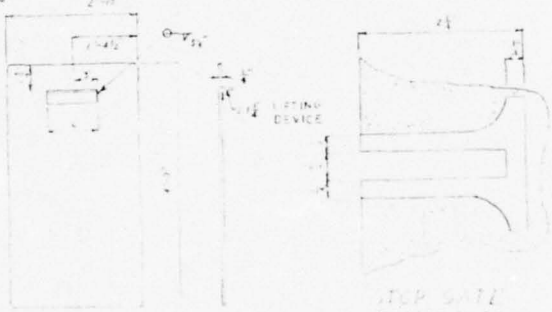
WATER SUPPLY INTAKE DETAIL @ EL. 1725'



WATER SUPPLY INTAKE DETAIL @ EL. 1725'

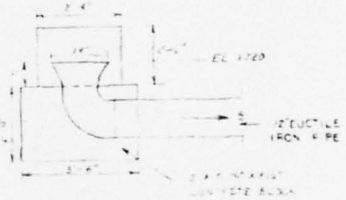


SECTION CC

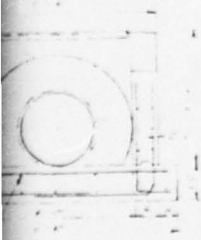


ADJUSTABLE STOP GATE

STOP GATE FRAME PLAN



WATER SUPPLY INTAKE DETAIL @ EL. 1720



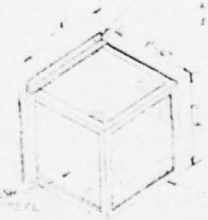


FIGURE 7

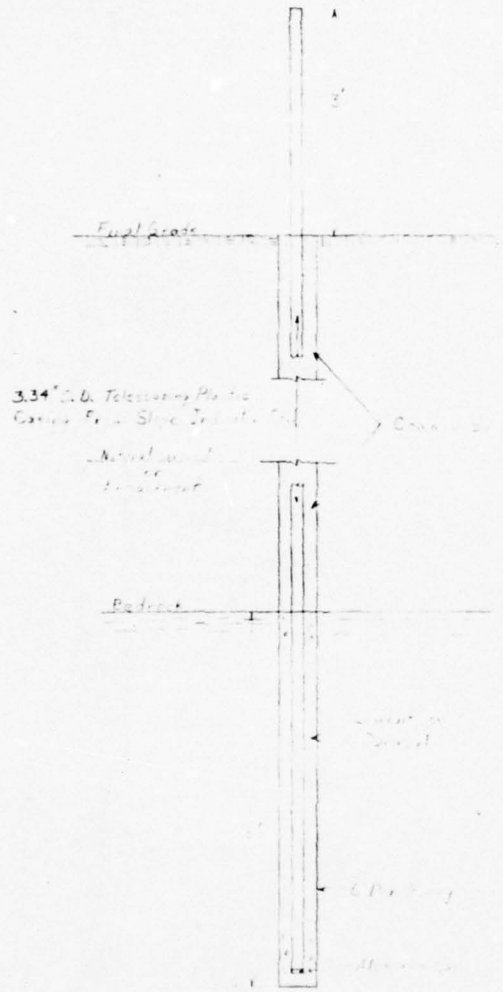
DATE	REVISED	BY

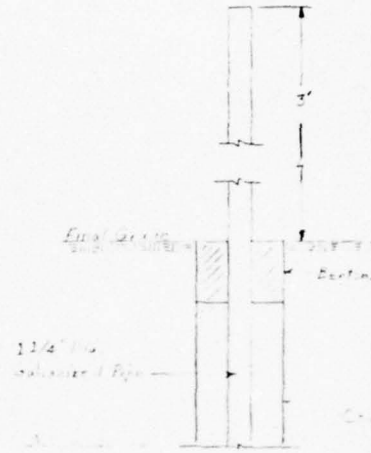
ONEIDA MINE NO. 4
WATER STORAGE DAM DESIGN
ONEIDA MINING CO. INDIANA CO. PA.

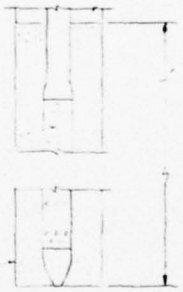
OUTLET WORKS DETAIL

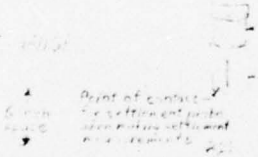
L. ROBERT KIMBALL
CONSULTING ENGINEERS
EBENSBURG PENNSYLVANIA PITTSBURGH

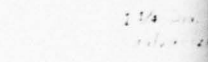
DRAWN BY	DATE	CODE NO.	SHEET NO.
TRACED BY	DATE		4
CHECKED BY	DATE	SCALE	
APPROVED BY	DATE	AS NOTED	OF 11


Finish Grade
3.34" O.D. Telescoping Pipe
Natural Ground
Bedrock


Finish Grade
1 1/4" Dia.







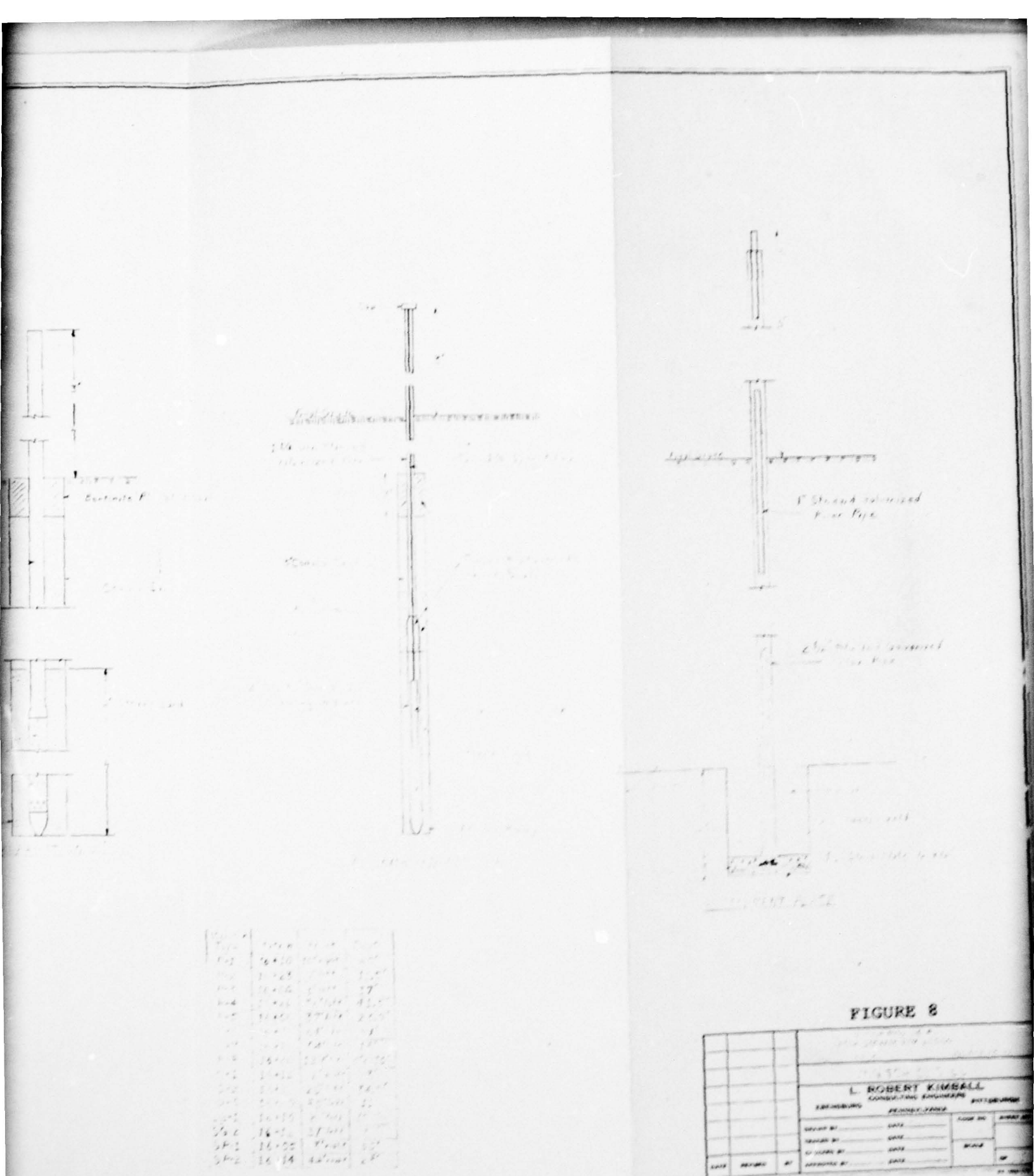
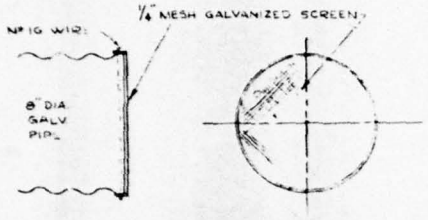
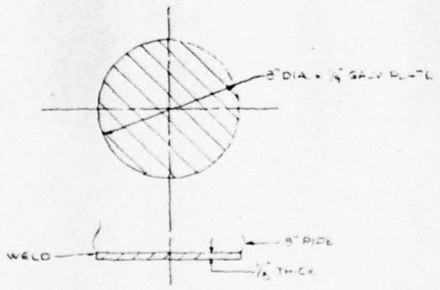


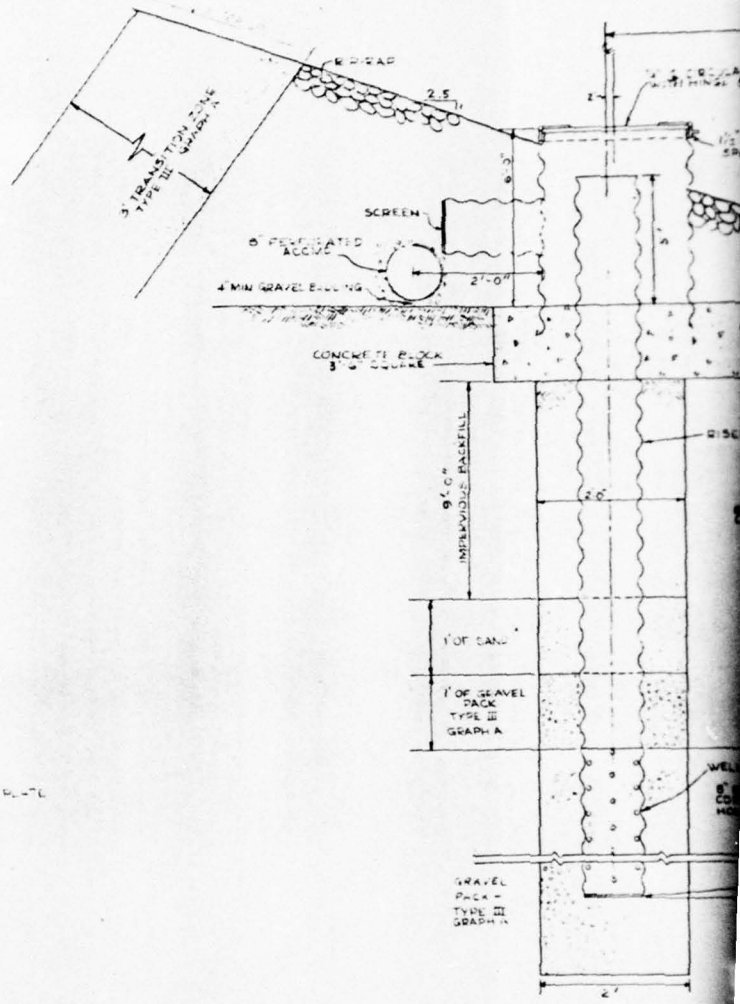
FIGURE 8



SCREEN DETAIL
NOT TO SCALE



PLUG DETAIL
NOT TO SCALE



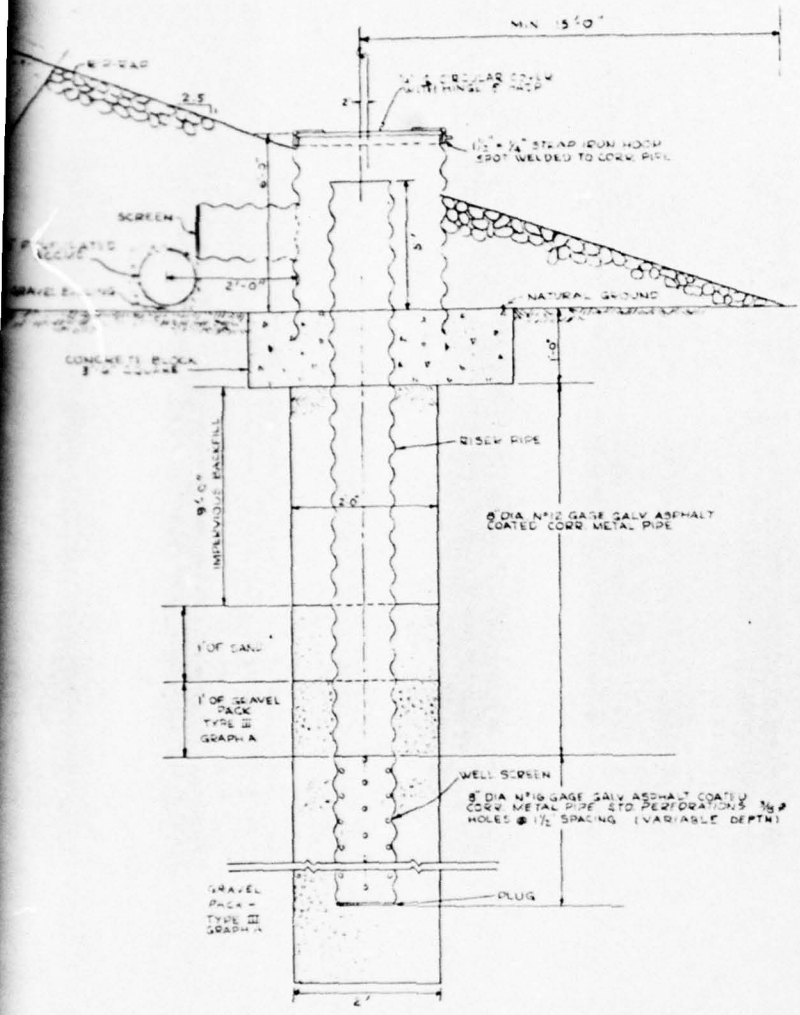
RELIEF WELL DETAIL
APPROX SCALE 1"=1'-0"

OBSERVATION WELL DATA

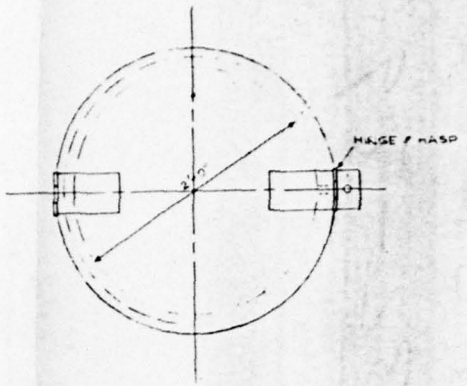
OBSERVATION WELL NO	DAM STATION	APPROXIMATE DEPTH (FT) BELOW EXISTING GROUND LINE
1	15+25	35±
2	15+75	35±
3	16+25	35±
4	16+75	35±
5	17+25	35±
6	17+75	35±
7	18+25	35±
8	18+75	35±

RELIEF WELL DATA

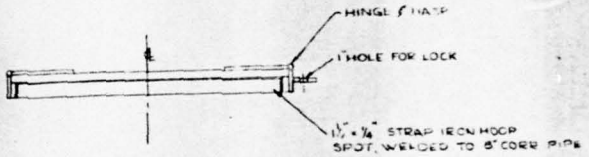
RELIEF WELL NO	DAM STATION	APPROXIMATE DEPTH BELOW EXISTING
1	15+00	35±
2	15+50	35±
3	16+00	35±
4	16+50	35±
5	17+00	35±
6	17+50	35±
7	18+00	35±
8	18+50	35±
9	19+00	35±



RELIEF WELL DETAIL
APPROX SCALE 1" = 1'-0"



CIRCULAR COVER
TOP PLAN
NOT TO SCALE



CIRCULAR COVER
NOT TO SCALE

RELIEF WELL DATA

RELIEF WELL NO	DAM STATION	APPROXIMATE DEPTH (FT) BELOW EXISTING GROUND LINE
1	[illegible]	[illegible]
2	[illegible]	[illegible]
3	[illegible]	[illegible]
4	[illegible]	[illegible]
5	[illegible]	[illegible]
6	[illegible]	[illegible]
7	[illegible]	[illegible]
8	[illegible]	[illegible]
9	[illegible]	[illegible]

FIGURE 9

ONEIDA MINE NO 4
WATER STORAGE DAM DESIGN
ONEIDA MINING CO. [illegible]

RELIEF WELL DETAIL

L. ROBERT KIMBALL
CONSULTING ENGINEERS
EBENSBURG PENNSYLVANIA PITTSBURGH

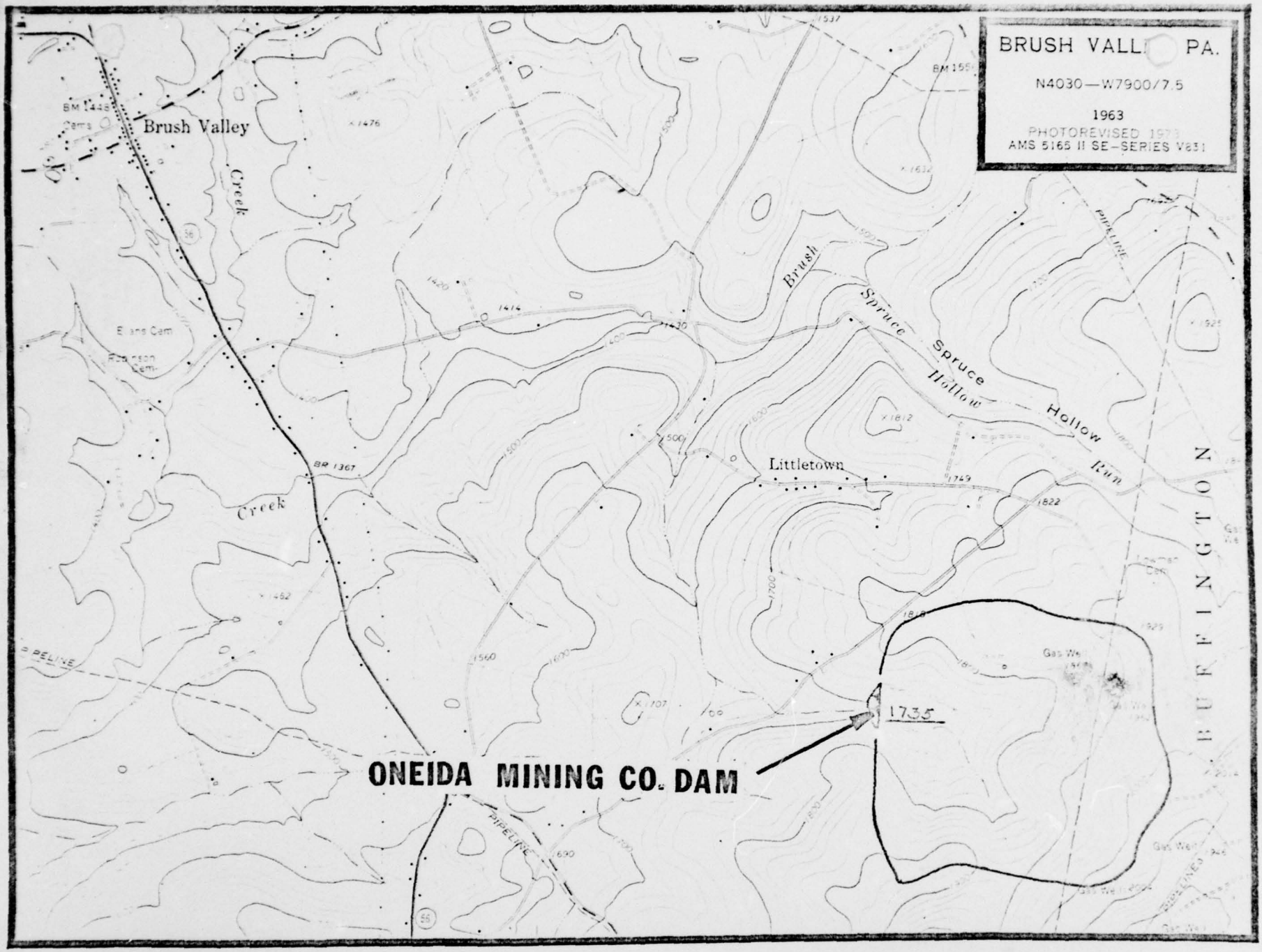
DATE	REVISED	BY

DRAWN BY ____ DATE ____
TRACED BY ____ DATE ____
CHECKED BY ____ DATE ____
APPROVED BY ____ DATE ____

CODE NO. 73-0-9
SCALE

APPENDIX G

REGIONAL VICINITY MAP


BRUSH VALLEY PA.
N4030—W7900/7.5
1963
PHOTOREVISED 1973
AMS 5165 II SE—SERIES V831
Brush Valley
Creek
Brush
Spruce
Hollow
Run
Littletown
PIPELINE
BUFFINGTON
1735
ONEIDA MINING CO. DAM